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# UROLOGY

VOLUME II

# UROLOGY

## THE DISEASES OF THE URINARY TRACT IN MEN AND WOMEN

*A BOOK FOR PRACTITIONERS AND STUDENTS*

BY

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*WITH NINE HUNDRED AND FORTY-THREE ILLUSTRATIONS IN TEXT AND SEVEN PLATES*

VOLUME II

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# UROLOGY

## VOLUME II

---

## CHAPTER XXXIV

### EXAMINATION OF THE BLADDER

In examining the bladder the following methods are available:

*A.* Physical examination:
- (*a*) By inspection.
- (*b*) By palpation, including abdominal, rectal, vaginal and bimanual.
- (*c*) By percussion.

*B.* Instrumental examination:
- (*a*) By catheters.
- (*b*) By stone searchers.
- (*c*) By sounds.

*C.* Cystoscopic examination.

*D.* X-ray examination.

### A. PHYSICAL EXAMINATION

(*a*) **Inspection.**—The bladder can be outlined visually in some cases, when the organ is very much distended in a very thin subject. Such bladders are seen occasionally in prostatic hypertrophy with retention, or in paralysis of the bladder in locomotor ataxia or lateral sclerosis. Sometimes these bladders appear like enormous pears or elongated melons in the abdominal cavity, usually in the center but sometimes on one side. Distended bladders rarely, however, extend beyond the umbilicus, and the upper pole is usually between the umbilicus and the pubes.

(*b*) **Palpation.**—On palpation, the bladder can be easily outlined when it is full and tense; but in other cases, dilated bladders, although full of fluid, have flaccid walls and cannot be well defined. In cases in which a full bladder is examined by rectum with the patient on his back, especially if its walls are hypertrophied, it may feel like a solid tumor or a gravid uterus.

Bimanual palpation with the finger of one hand in the rectum or the vagina and with the fingers of the other hand on the hypogastrium, may give the

most useful information as to the size and distention of the bladder when it is full and often as to the presence of vesical new growths or stones when it is empty. I must confess that, although I have been able to feel a stone by this method, I have never been able to determine accurately its size and shape. I have been better able to judge the stones by cystoscope; but even here I often am wrong regarding shape and size. In the cases in which the stones were large enough to be felt by rectum, the abdominal walls were thin and so aided bimanual palpation. I have felt in a number of cases tumors of the bladder by bimanual palpation, especially malignant growths where there was much infiltration, and have been able to outline them definitely as was demonstrated later by cystoscopy and operation.

(*c*) **Percussion.**—Percussion of the hypogastric region is practiced as a matter of routine in all urinary cases that come to me for examination. The method, however, does not give much information save in cases in which there is considerable distention, when we can often outline distinctly the area of bladder dullness. Palpation is a much more useful method for determining the presence and amount of distention, because considerable distention can be present without giving rise to abdominal dullness on percussion, for the reason that intestines may find their way between the abdominal wall and the bladder, thus giving a tympanitic note.

The three methods just considered are all useful to a certain degree as preliminaries to more special examination. They do not furnish such useful nor such positive data as do instrumental examination and cystoscopy.

A number of conditions may simulate distended or diseased bladder on percussion and palpation. Thus, in women, pelvic exudates, tumors of the uterus and ovaries, hydatid cysts or new growths of the bladder may be mistaken for retention of urine, and it is always important to empty the bladder and to exclude retained urine at the time of the examination.

I have seen a number of cases in which appendicitis with a large pelvic abscess was mistaken for an enlarged bladder. In these cases, the appendix was often adherent to the back of the uterus in women, between this organ and the rectum; whereas, in men, it was adherent to the rectum, bladder or the space between them. In all such cases, however, it is the resulting abscess filling the pelvis and pressing on the bladder that causes the mistake.

The same applies to hydatid cysts occurring in the space between the rectum and the bladder. These press the bladder down and take the place of it, causing urinary symptoms through pressure and substituting a tumor which may be mistaken for a distended bladder on palpation. These tumors may occur in women, though not so frequently as in men.

Tuberculous peritonitis may also simulate a full bladder, especially if the fluid be walled off. In almost all cases of tuberculous peritonitis, the fluid gravitates to the pelvis and, therefore, a small amount is present; but when

the tuberculosis is extensive, situated principally in the lower part of the abdomen, a quantity of fluid will be present in that region. The fluid changes its position, however. on moving the body, unless walled off.

## B. INSTRUMENTAL EXAMINATION

An instrumental examination of the bladder is indicated only in cases in which an instrument should be introduced into this organ. In acute urethritis, without bladder symptoms, it would be folly to try to examine the bladder, as this would not only aggravate the urethral condition, but it would also tend to infect the bladder, which might be aseptic. It is, then, only in chronic urethral, prostatic, bladder and kidney cases, or in the diagnosis of pelvic tumors pressing on the bladder from the outside, that instrumentation of the bladder should be employed. When a patient has a urethritis with bladder symptoms, the bladder should be examined only when the urethritis has subsided under treatment.

**Instruments Used.**—The instruments used in exploring the bladder, besides the cystoscope, may be grouped in three classes: Catheters, sounds and stone searchers. Catheters are of soft rubber, of woven material or of metal. The best woven catheters are made of silk and are imported. The old English catheter, with the stilets, can only be condemned, as they often cause traumatism, although they can sometimes be more easily manipulated than others by the prostatic patients living a catheter life. The French woven catheters are of any size, better material, more pliable and less dangerous to the tissues, and should be substituted for them.

Woven Catheters.—The woven catheters can be made into many more forms, such as the straight, olivary tipped, coudé and bi-coudé, all of which should have beveled eyes. They hold their shape better than the soft-rubber catheter. The simplest shape of woven catheter is the straight one with the tip rounded and an eye near the tip. The olive-tipped catheter has its olive-shaped tip situated beyond the eye and has a small neck leading out to it. This tip is, perhaps, but a third or even less in circumference as compared to the remaining part of the instrument. It is thus easy to see that, in using an olive-tipped catheter—say No. 18 French, we may have a tip of—say 8 or 6 or even 5 French, which can more easily be worked through a strictured portion of the urethra into the bladder. These instruments of the sizes from 6 to 12 are often better able to pass through tight strictures than filiforms are (Figs. 141–144).

*Coudé or Elbowed Catheter.*—This has an elbow or bend like the short beak of a sound at the end, and is used in examining bladders of old prostatic cases. It is known that the prostatic urethra is irregular and very often has a little hillock in its floor, this hillock being due to the enlargement of the posterior part of the gland. When the slant of the bend of the elbowed instrument strikes

the slant of the prostate, it tends to slide along it into the bladder; or against the anterior urethral wall, when it can be guided into the bladder; whereas, a straight instrument, in striking such an impediment, often becomes wedged in and remains there, giving rise to traumatism, or by the impact tends to irritate the tissues and cause a spasm of the sphincter muscle of the bladder.

*Bi-coudé catheters* have two bends at the end instead of one. On account of the deformities of the prostate gland, such as are described in the chapter on The Prostate, it can easily be seen that there are, at times, many protrusions or impediments in the posterior urethra rendering entrance into the bladder difficult. A catheter with two bends at the end is consequently more useful in worming through corresponding curves in the posterior urethra in cases of prostatic deformity or hypertrophy. (See Figs. 142–145.)

*Advantage of the Woven Catheter.*—The advantage that the woven catheter has over the rubber catheter in bladder examinations is that, although pliable, it is stiffer than soft rubber, and, on reaching a point in the canal where the soft-rubber instrument might double on itself, the woven instrument retains its shape and holds its beak at the point of resistance, usually the compressor urethræ muscle, until the muscle gradually relaxes and the instrument passes. We can also follow the urethra better with a woven catheter, as there is more of a sense of feeling the variety of the impediment, or whatever else the tip comes in contact with, than is imparted through the soft-rubber instrument. It is for this reason that, for the examination of patients' bladders in testing their capacity, the presence of residual urine in cases of stricture and enlarged prostate, woven catheters are of value.

*The Use of Mandrins in Woven Catheters.*—Mandrins are metallic shafts, pieces of strong wire which can be introduced into the lumen of a woven catheter and can change the curve of a coudé catheter into a bi-coudé. A woven catheter can be shaped by bending the mandrin in the proper manner, softening the catheter by soaking in hot water, introducing the mandrin and allowing the catheter to dry over it. The catheter then remains in the desired shape. In this way a variety of shapes can be secured. When it is desired to add stiffness to a woven catheter which we are trying to pass through an obstruction, as in prostatic hypertrophy, the catheter is introduced with a mandrin in it and, when it has passed into the prostatic urethra and is in contact with the obstruction, the mandrin is gently withdrawn. We then continue to feel our way with the catheter alone in the left hand and by gently pulling upon the mandrin from time to time with the right. The time finally comes when the end of the catheter is felt to be free, showing that its end has passed by the bladder obstruction; then the mandrin should be quickly withdrawn to a greater degree, and a slight movement made upward, which passes the catheter into the bladder, the urine escaping through the instrument. If not successful in passing the obstruction, the catheter may be withdrawn and the mandrin

again inserted and the maneuver repeated. This method is especially applicable in cases of retention due to prostatic hypertrophy.

Soft-rubber catheters, straight or coudé, should be used, however, whenever possible, in examining the bladder, as they are less liable to cause traumatism. They have been much improved in quality and finish during the last few years. Elbowed soft catheters of this variety are often introduced into the bladder as easily as a woven catheter.

Metal Catheters.—These are used by some surgeons for the exploration of the bladder; but, personally, I do not use them, save in exceptional instances. Metallic catheters present no advantages over the soft and elastic variety and are more apt to cause traumatism and consequent hematuria and infection. The metallic catheters employed have a curve like a sound and two lateral openings, usually near the tip. They should be employed when the others fail to pass (Fig. 148).

Catheter Examination.—In the examination of the bladder, except when an acute urethritis is present, a catheter should always be introduced, if possible, as a matter of routine, to test the amount of residual urine present. The patient may give no symptoms which would lead the examiner to think of the presence of residual urine, but if a small catheter is inserted, perhaps there may be an escape of two ounces or more of residual fluid. This applies particularly to patients who have a prostatic enlargement which is latent and where no inflammation is present. It also applies to patients who have a beginning sclerosis of the spinal cord. Sometimes the presence of residual urine would be the first factor in a general examination to indicate the presence of some disease which is interfering mechanically, or through the nervous system, with the function of the bladder.

In office practice, in making examinations, I generally use sizes 10 to 12 soft-rubber catheters. In examining for residual urine, as soon as the patient has passed all his urine standing, he should have a catheter introduced in a standing posture; or else, if lying on a table, he should be brought to a sitting posture after the catheter has been introduced. The residual urine should always be measured, as it is an important point to be considered, especially in the treatment of prostatic cases. It is also the keynote to the future of the bladder, as far as its tonicity is concerned; besides which, it would indicate in many cases whether the quantity is great enough to warrant the use of a catheter in a routine way. It is also advisable to note the amount of urine that the patient passes spontaneously. If the patient is one who may be operated on later, it is advisable to fill the bladder through a catheter and then measure the amount passed through the instrument in order to ascertain the capacity of the bladder. This is often a very important point in deciding between a suprapubic and an infrapubic cystotomy, as in the former a greater dilation of the bladder is desired.

Thompson Stone Searcher.—This instrument consists of a shaft which is perfectly straight and ends in a curve like that of the metallic catheters, but is shorter. The shaft is hollow and the tip is provided with lateral openings. Graduation in inches or centimeters are sometimes placed on the shaft. A stopcock is provided, controlling the flow of fluid through the instrument. (See Fig. 427.) When we are using this instrument, we place the patient in a semireclining position, so that the stone will gravitate downward, and the searcher is moved about in the bladder by short, sharp movements in order to see whether it can come in contact with the stone. While the Thompson searcher is now used less than formerly, inasmuch as the cystoscope is much more practical for vesical examinations, the older instrument is still of value in cases in which cystoscopy cannot be performed at the time of the examination on account of a strictured urethra or an insufficient bladder capacity. When the searcher reveals the presence of stone, the diagnosis can be made with a fair degree of certainty without subjecting the patient to cystoscopy. When the searcher does not reveal the stone, however, the latter may still be present in some part of the bladder not touched by the searcher, as in a pouch behind the prostate.

Fig. 427.—Thompson's Searcher.

Metallic Sounds.—Metallic sounds, which have already been described in the chapter on Urethral Examination, are also of use in examining the bladder. For the latter purpose, sounds with the Otis curve are the best, as they enter the bladder more easily than the other varieties. Personally, I have felt more stones with the sound than with the stone searcher. After examining the urethra with the bougies à boule to determine its size as far as the cut off, I always pass a sound of the size of the anterior urethra, through the membranous and prostatic portions into the bladder, to ascertain the size of the entire canal. (See Fig. 170, Vol. I.)

Length and Diameter of Catheters, Sounds, etc.—The length of the male instrument is usually from 24 to 36 cm. For women, catheters of 16 cm., or a little longer, are also made.

**Technique of Catheterization.**—The patient should be placed on a table with the head and shoulders somewhat elevated and the knees and thighs slightly flexed, the surgeon standing on the left side of the patient. The penis is grasped in the left hand and is drawn upward perpendicularly to the abdomen and in the median line, the lips of the meatus being separated to admit the catheter. The catheter is held in the right hand, its end is introduced into the urethra and made by a gentle impulse of the hand to glide down the canal to the bulb. As soon as the eye of the catheter passes through the internal sphincter and enters the bladder, the tip will be felt free and fluid will begin to escape from the bladder. Much can be learned from the way in which the urine escapes from

the catheter as to the contractility of the bladder walls, and as to the presence of residual urine. (See Technique of Passing Sounds, pages 177 and 178, Vol. I.)

If the stream is projected from the end of the catheter in a steady curve, there is good contractility or tone. If the contents of a full bladder flow slowly through the catheter, there is less contractility or atony. This is usually the result of obstruction, such as stricture or prostatic hypertrophy, or of spinal disease.

By means of the catheter, we can also find out the sensitiveness of the bladder and its tolerance to distention. After the catheter is introduced, sterile water is injected by a large piston syringe, or by a fountain syringe, until the patient complains of fullness, and the amount thus retained is noted.

In catheterizing normal bladders, as well as in disease, we must remember that the bladder empties by the approximation of the anterior to the posterior walls and the rising of the bottom and the lowering of the top of the viscus in such a way as to form a Y-shaped triangular figure in section when the bladder is empty. It may be seen that, if the catheter is introduced too far into the bladder, its eye may be obstructed by a collapse of the walls over its end. If we withdraw the catheter slightly in such cases, we will obtain more fluid from the incompletely emptied viscus. A good plan in emptying the bladder is to withdraw the catheter slowly as the fluid flows off, so that the eye of the catheter may keep pace with the contracting walls.

In disease, there may be many causes of obstruction to the flow of urine through the catheter, as pieces of mucus, purulent masses, clots, bits of tissue and stone. Difficulty in evacuating the urine through the catheter is also presented when there is a sudden overcontraction which pushes the eye below the internal meatus. Sometimes the bladder is in such an atonic condition that it is necessary to aid nature by pressure upon the hypogastrium.

In evacuating the bladder, it must always be remembered that not more than sixteen ounces of residual urine should ever be withdrawn at the time of the examination, as the withdrawal of a larger quantity might give rise to a serious condition owing to a congestion of the bladder or kidneys.

## C. CYSTOSCOPIC EXAMINATION

This subject is treated of under the chapter on Cystoscopy.

## D. X-RAY EXAMINATION

Radiography of the bladder is not considered, as I feel that the modern cystoscope enables us to determine a vesical calculus with more certainty than would radiography. In cases, however, of suspected stone in which for some reason cystoscopy cannot be performed, or we are not satisfied with the cystoscopic examination, radiography should be employed.

# CHAPTER XXXV

## CONGENITAL MALFORMATIONS OF THE BLADDER

CONGENITAL malformations of the bladder consist of exstrophy, an inferior vesical fissure, a superior vesical fissure (umbilico-vesical fistula) and ectopy of the bladder.

### EXSTROPHY

This congenital deformity of the urinary apparatus is characterized by the absence of the anterior vesical wall, the posterior wall presenting in the hypogastrium and protruding more or less between the recti muscles. It was described as early as the seventeenth century, and it was then considered as a hernia of the intact and open bladder through the abdominal wall. The correct interpretation of the lesions of exstrophy was given in 1769 by Devilleneuve, and thirteen years later the term exstrophy was first applied to the condition by Chaussier. The pathogenesis and therapeutics have been under consideration for the last century, but although much valuable knowledge has been acquired, the problem has not yet been definitely solved.

**Pathological Anatomy.**—COMPLETE EXSTROPHY.—A protruding tumor is seen in the median line of the lower part of the abdomen. It is of a red color and has a puckered surface, being formed by the posterior wall of the bladder which has become convex instead of concave through pressure of the intestinal coils and the absence of anterior support. The dimensions of the protruding part are variable in size and are influenced but little by effort or repose as is an ordinary hernia. It does not disappear and cannot be returned; pressure on its surface causes it to form folds and to flatten, but on removal of the pressure it at once bulges out again.

The surface of the bladder shows its mucous lining to be red and usually excoriated, and covered at times with crusts, especially on the borders. On each side and low down, are two small orifices, the ureteral openings, hidden in the folds of the mucous membrane, that allow the urine to escape in small, intermittent spurts, which increase in frequency upon local irritation as by touching the neighboring mucous membrane. The ureteral openings are closer together than in the normal condition, the trigone being atrophied. The outline of the tumor becomes continuous with the abdomen; the bulging mass is covered with

mucous membrane of a dusky hue, while a white retracted zone of scar tissue forms the border line between the mucosa and the normal skin. The umbilicus is lower than normal and may be entirely hidden at the level of the superior pole of the protruding organ. The urachus is often absent and is crescent-shaped with the concavity turned downward.

*Condition of the Genital Organs.*—More or less important deformities are present. In the male there is always epispadias; the penis is short and flattened, the urethra open above, being continuous with the inferior portion of the vesical mucosa. The thickened prepuce appears below the glans as a voluminous fold flattened out in a large wad. The scrotum is of normal form, but small size. There is, as a rule, inguinal or abdominal retention of the testicles. The seminal vesicles are generally absent or atrophied, but may be normal.

In the female, the labia majora and minora and the two roots of the clitoris are widely separated, the vulva being represented by a mere fissure. The vagina and uterus may be double. The anus is always more anteriorly situated than normal, and the perineum is atrophied.

The question of the vesical sphincter and of the prostate is a mooted one; frequently there is neither prostate nor vesical sphincter. The prostate gland usually exists in a rudimentary state, whereas the sphincter is always absent or too much atrophied for attempts at restitution. Thierfelder mentions a case of exstrophy in which the prostate gland was tolerably well developed, which was also the state in a patient operated on by me whose case I have reported.

The pelvic bones and articulations present important lesions. The symphysis is separated by a distance of from 3 to 12 centimeters, involving the recti muscles which join in the median line above the bladder only. The two pubic bones have a ligamentous union only. The two tuberosities of the ischium are widely separated; the obturator foramen is diminished in size. In compensation for the absent symphysis, the sacro-iliac articulation is of exaggerated thickness. The tipping forward of the sacrum correspondingly shortens the sacro-pubic diameter.

The ureters distended by the exstrophy and compressed by the intestinal coils, are almost invariably dilated and sometimes inflamed. Other malformations may exist with exstrophy, such as imperforate anus, spina bifida, club-foot or harelip.

**Etiology and Pathogenesis.**—Vesical exstrophy is a rare condition, more frequently observed in the male. According to Neudorffer, it occurs only twice in 100,000 births and ninety per cent approximately of the children thus affected perish in infancy.

The mechanical and pathological theories, which were formerly used to account for the evolution of this peculiar affection, have been followed by the teratological theories, which alone are worthy of consideration, as affording a rational interpretation of the trouble.

**Symptoms.**—Individuals suffering from exstrophy have a peculiar, duck-like gait; the enlarged and broadened pelvis resembles the female pelvis; the lacking solidity of the symphysis compels them to an oscillating mode of progression, rather similar to that resulting from congenital double fixation of the hip joint.

The leading symptom of vesical exstrophy is urinary incontinence. The urine is constantly dribbling away, irritating the neighboring parts, soiling the clothing and causing a very unpleasant urinary odor in the vicinity of these unfortunate persons.

The next great cause of misery for the patient is the sensitiveness of the bladder wall in contact with the clothing. The bladder wall is always congested and usually inflamed and ulcerated. Patients are sometimes so uncomfortable that they leave the bladder uncovered and wear, winter and summer, a long coat that they can hold away from the bladder with one hand. Women can help themselves more easily by the use of hoop skirts.

Sexual desire in the male is diminished or absent; moreover, coition, and especially procreation, are impossible. In the female, coition is not only possible, but may be followed by impregnation and parturition (Klein). After delivery, the uterus descends and remains prolapsed.

Exstrophy does not directly threaten life; there are instances on record of an advanced age having been reached by patients suffering from it. However, complications are liable to set in as the patient advances in years and are a constant menace to these unfortunates. The prognosis is correspondingly grave. Vesical exstrophy is made especially deplorable by the helplessness of therapeutics for the establishment of urinary continence.

**Treatment.**—For the management of the serious inconveniences of exstrophy, two forms of interference may be resorted to. These are, mechanical appliances or a surgical operation.

Mechanical Appliances.—Mechanical appliances protect the mucous surface of the bladder from the friction of the clothing, and they receive the urine and prevent its constant dribbling upon the patient's garments. They consist of a funnel or plate of silver, hard rubber or gutta-percha which fits over the exstrophy and the perineum and connects in its dependent portion by means of a tube with a receptacle for the urine, which is bound to the patient's leg. Apart from rendering useful service, these appliances cannot modify the deformity.

Operative Treatment.—The methods of treating exstrophy by operation are: (1) Approximation; (2) urinary deviation; (3) transplantation of the ureters with the intestine; (4) the autoplastic method.

The *method of approximation* appeals to one as the rational method for a cure of this trouble. This consists of two steps: The approximation of the pubic bones and the sewing of the borders of the tissue outside of the bladder

together, after they have been freshened, thus inverting the bladder and making a pouch of it. This close apposition by suture is only feasible when there is but slight separation of the pubic bones. In the majority of cases, these bones cannot be approximated and are too widely separated for a beneficial result in endeavoring to invert the bladder. It is important, therefore, to take the children with exstrophy shortly after birth or at the earliest possible age and to construct some orthopedic apparatus that can be constantly worn and will tend to approximate the gap between the pubes better than by straps or other similar methods.

When the pubic bones have been finally brought together, this approximation should be preserved by wiring them and also by sewing up and inverting the bladder, and covering over and approximating the urethra as well, in an effort to obtain a covered canal and as much as possible of a working bladder sphincter. This operation is difficult, tedious and is not held in very high esteem, probably for the reason that the patients are not seen and treated at an early enough age. Trendelenburg reports the case of a boy three and a half years of age who was operated on five times during two and a half years. It was necessary in this case to separate the patient's synchondroses. After the soft tissues had been united, the patient had urinary continence. The operation is claimed to have had a favorable influence on the development of the penis.

The method of direct suture of the vesical margins is indicated in such cases where the exstrophy is not prominent and the muscles not much separated —in a word, where an approximation of the freshened margin of the bladder can be secured.

The *method of deviation*, another means resorted to for the establishment of urinary continence, consists in directing the course of the urine to the bowel, in order to utilize the anal sphincter. This method was first inaugurated by Simon in 1851. Notwithstanding the mechanical difficulties of the operation and the liability to subsequent intolerance and reaction, this method has been considered by many operators as the one of choice.

*Maydl's Operation for Exstrophy.*—Maydl's method is the one most commonly adopted. He resects the portion of the trigonum, into which the ureters empty with both canals intact, from the remainder of the vesical wall and implants it into the sigmoid flexure of the colon. In favorable cases, the anal sphincter insures complete continence. It cannot be said of this operation that it is anything more that a makeshift employed at a time when as yet no scientific operation, on account of its rarity, had been devised for the cure of this trouble. The improved technique in surgery has rendered the operation much safer than formerly; but the ultimate results in the patients' surviving the operation are about the same, and are due to the subsequent infection of the ureters and kidneys. The operation in the most favorable cases will always be a serious one and pyelo-nephritis or pyonephrosis are bound to occur ultimately

and cause the death of the patient unless it is brought about by some intercurrent disease.

The *autoplastic* method is the most satisfactory procedure, although the operation requires great patience and careful after-treatment. It was originated by Roux in 1853 and consisted in covering the bladder surface by a thin flap. A number of operators have modified the procedure and improved upon it, especially Wood in England and Le Fort in France. The Roux-Wood operation consists in using three flaps of skin, one from above and one from each side of the bladder, turning them in such a way that the skin surface will come in contact with the mucous membrane of the bladder. When successful, the bladder wall is protected, which is most important when one considers that the two principal inconveniences arise from the contact of the clothing with the bladder surface and the dribbling of the urine upon the legs and clothing. The patient can frequently hold a number of ounces of urine during the night and can wear a urinal during the day. In this way, he will be able to lead a fairly comfortable life. The chief inconvenience results from the growth of hairs into the bladder and the formation of small calculi upon them.

**Illustrative Case of Exstrophy of the Bladder.**—The patient was a strong, healthy man, twenty-nine years of age and a blacksmith by occupation. When a child, he passed as a girl and later wore women's clothes until the age of nineteen, when he changed to the male attire. He found that the slightest pressure of any garment on the surface of his bladder was unbearable, and for this reason wore an ulster both winter and summer. When in the erect posture he kept one hand constantly inside the ulster to hold it away from his bladder, while at other times he worked in a stooping posture, allowing the ulster to fall away from the inflamed surface.

He had tried a number of mechanical appliances and especially constructed apparatus to drain away the urine, all of which had proved inadequate, besides causing great discomfort and giving rise to excoriations. On account of this, he discarded them and, instead, cut out a V-shaped piece from the front of his trousers, to allow the urine to trickle away, keeping his trousers constantly wet in preference to the discomforts which he experienced in the use of appliances.

In this condition, he presented himself at my clinic in the New York Post-Graduate Medical School, having been sent by Dr. Andrews, of Muncie, Ind.

*Examination.*—The patient was a well-nourished man, about medium height. He walked with a slight waddle, or ducklike gait, probably caused by the separation of his thighs as a result of the gap between his pubes.

His bladder was in a state of exstrophy (see Fig. 428 A), and his penis was epispadic. He measured 14 inches from the sternum to the base of the glans penis, and 14 inches across from one anterior superior spinous process to the other. There was no umbilicus seen. The bladder protruded about an inch beyond

the surface of the skin, and measured slightly over 4 inches in diameter (Fig. 428 B). It was deep red and inflamed (cystitis). Its surface was covered in places with mucus. There were small ulcers and excoriations present. The surface was very tender to the touch. Both ureters could be seen discharging the urine with the same rhythmical contractions that one sees through the cystoscope. The urine obtained from each ureter was opaque, and contained pelvic and ureteral epithelia. Neither side was infected. The trigone of the bladder was deep red in color, and tapered down to the prostatic urethra. When the end of the glans penis was grasped and pulled down, the prostate was seen to be open, showing the two lobes, one on either side, with the urethra running between them. The glans, with the dorsum split down to the urethra, was grafted on to the apex of the prostate in such a way that the urethra was about 2½ inches in length, consisting simply of a prostatic and a balanic part. No membranous urethra was found present, and the corpora cavernosa extended out laterally to the rami of the pubes and ischia. The mouths of the ejaculatory and the prostatic ducts could be plainly seen, about two dozen of these openings being counted, which extended up to the prostatic follicles (Fig. 429).

Fig. 428 A.—Exstrophy of the Bladder, Anterior View. The trousers are drawn to one side, leaving a V-shaped space without covering over the bladder wall, as by this means the clothing does not touch the bladder. (Author's case.)

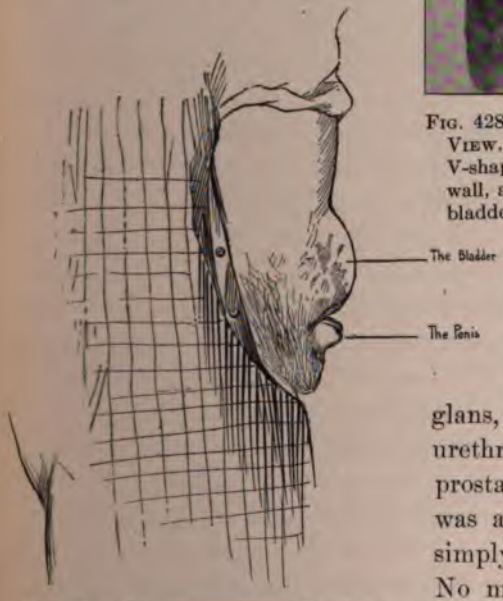


Fig. 428 B.—Exstrophy of the Bladder. Showing the bulging of the bladder for about an inch as viewed from the side. It measured about four inches in diameter. (The same case as Fig. 428 A.)

The prostate was small, about one half inch above the anus, and had a peculiar feel on account of its loose attachments and its being placed so far forward. It was massaged, but nothing was seen to come from its ducts.

The testes were present, and situated higher up than usual, but not retained, the cords evidently being quite short.

The pelvic bones were separated for three and a half inches in front. X-ray examination was unsatisfactory.

*Symptoms.*—The past symptoms were the same as the present, namely, exquisite tenderness over the bladder and incontinence of urine. The patient had had an occasional attack of ureteral retention on the right side, with the subsequent evacuation of several ounces of urine. (He stated that on one occasion he estimated the amount as one pint in quantity.)

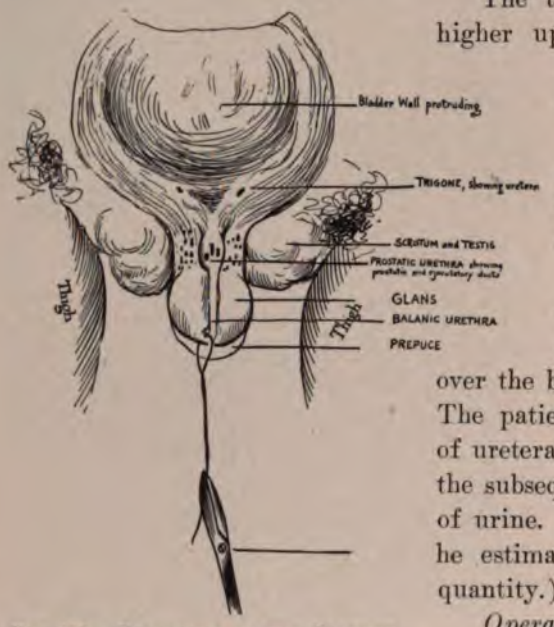


FIG. 429.—EXSTROPHY OF THE BLADDER. Showing the bladder and the ureteral orifices, the prostatic urethra with the prostatic and ejaculatory ducts opening into it, as well as the glans penis directly connected with its prostatic portion.

*Operation.*—When the question of operation came up, there was the choice of the plastic operation, taking flaps from around the bladder, or a transplantation of the ureters into the rectum. It seemed to me that better results could be obtained by the plastic operation. The transplanting of the ureters into the rectum, while attended with success, often causes a very irritable condition of the rectum. In time, the rectum can hold a certain amount of urine, but in escaping it produces an irritation about the anus and the cleft between the nates. Again, the rectum itself may become inflamed. In these cases, there usually occurs later an extension of the infection up the ureters and into the pelvis of the kidneys, giving rise to pyelitis, and the patients usually die later on from pyelo-nephritis.

The operation performed, as above stated, was a modification of the Wood-Roux method, simply using a double layer of skin flaps of sufficient size to cover the wall of the exstrophied viscus, the same as I will describe in the chapter on Bladder Operations. In this patient, the skin of the abdomen seemed to be very free from hair. If hairs had been present, I would have destroyed them by electrolysis before operating.

Catheters were introduced into the ureters and brought out through the

urethral slot covered later by the plastic operation. A soft catheter was placed in the bladder along the same urethral slot as the catheters. This slot was later converted into a urethra. Instructions were given that the patient be kept in a reclining posture, but not allowed to lie down. Dr. Ayres had charge of the case after operation. The patient's recovery was uneventful.

In many of these cases, a great number of plastic operations have to be performed, but in this case there were but two lateral sinuses remaining, one healing about three days after the operation and the other in less than three weeks. Both healed spontaneously.

The denuded area above was covered with skin grafts taken from the thighs. Without further operation, the artificial bladder was able to hold urine. This I attribute to the fact that catheters had been introduced into the ureters, in this way carrying the urine directly to the outside without allowing it to come in contact with the bladder wall. The presence of a soft-rubber catheter in the bladder was also probably a factor in this gratifying result. I believe that this constant bladder drainage, and the maintenance of the sitting posture that I kept the patient in after the operation were the secrets of the rapid healing of the wounds in this case.

Six weeks after the operation, the patient experienced an erection for the first time in his life, which showed beginning activity of the genital apparatus. This has, I believe, been followed by even more activity of the genital organs.

When the patient was born, if the pelvis had been strapped and pressure applied, the pubic bones might have been approximated.

On leaving the hospital, the patient was able to hold seven ounces of urine at night and three during the day.

During the first weeks after the operation, he occasionally passed little concretions on hairs, but these made their appearance with less frequency, until now, at the present writing, he has had no trouble with these formations for a long time.

He now fully realizes the benefit of the operation. The edges of the wound are entirely closed, and are strong. Two inches above the penis, which consists simply of the glans, is a ridge extending one and a half or two inches transversely and an eighth of an inch vertically. If this is touched, he feels it in the region of the frenum. This is because it is the margin of the prepuce, which was brought up and attached to the exterior of the abdominal flap.

The balanic urethra is still epispadic, the sutures holding it together having given away. This is probably favorable to the patient, as otherwise he would have had a very much strictured canal. Hair is growing in the groins and on the sides of the flaps taken from the groins.

When I last heard from him, two years later, the patient was wearing a urinal and could go about his work without having any leakage (Fig. 430).

Occasionally, however, there was some leakage when he was sitting down, as he was wearing a urinal made for the normal man, in place of which he should have had one especially wide to fit better the four-inch space between his thighs, corresponding to the distance made by the separation of his pubes.

FIG. 430. — EXSTROPHY OF THE BLADDER. Patient as he goes about wearing a urinal after the operation.

The reason he has to wear a urinal is that he has not a good bladder sphincter, and when the organ contains a certain amount he must void it quickly or it will start to leak, thus wetting his clothing. The probabilities are that, as time goes on, the bladder wall will be strengthened more than at the present writing, and that the patient will then have better control of his urine. A description of the operation will be seen in the chapter on Bladder Operations.

## EXCEPTIONAL FORMS

Deformities of a similar type, but less complex, have been reported and are classified as:

(1) Inferior vesical fissure.
(2) Superior vesical fissure (congenital umbilico-vesical fistula).
(3) Ectopy of the bladder.

These various malformations are explained by their pathogenesis as transitional or intermediary stages, the ultimate degree of which would correspond to the complex lesion of total exstrophy.

(1) **Inferior Vesical Fissure.**—In inferior vesical fissure, the bladder opening is only at the level of the cleft in its dependent portion below the symphysis, establishing a communication between the cavity and the surface of the body. This anomaly is always associated with urinary incontinence and has been observed exclusively in females, the clitoris invariably being cleft with a single vagina and uterus.

(2) **Superior Vesical Fissure** (*Congenital Umbilico-vesical Fistula*).—In these cases, the symphysis is well formed, the fissure existing only in the superior portion of the bladder, in the vicinity of the umbilicus, thus approach-

ing through the persistence of the urachus, the condition known as vesico-umbilical fistula. Umbilico-vesical fistula must be regarded as congenital and classified next to exstrophy among the malformations of the bladder (Morer and Forgue). When the bladder becomes differentiated in the second month of fetal life as a bulging out of the intra-abdominal portion of the allantois, a prolongation of the latter still connects it with the umbilicus. The part uniting the bladder to the umbilicus becomes or forms the urachus. At first, this is evenly continuous with the summit of the bladder; it is hollowed out, its cavity extending sometimes through the umbilicus into the funicular portion of the allantois. Toward the middle of fetal life, the urachus becomes transformed into a solid cord. In certain cases, this allantoid canal persists up to birth and even to a later age. Sometimes no evil results follow; in other cases, a communication becomes established between the bladder and the umbilicus—an umbilico-vesical fistula, the cause of which is an earlier or later arrest of development.

Etiology and Pathogenesis.—Genget has endeavored to establish the frequency of occurrence of this anomaly. The urachus was found permeable in only 2 cases among 82 autopsies on the fetus and child, including one fetus of two and a half and another of nine months. Delore and Molin report a total of 25 observations. These fistulas become manifest in two different ways, according to their late or early evolution. They may appear at a more or less advanced stage of existence and have been ascribed either to a latent permeability of the urachus which has become manifest, or to a sudden reëstablishment of the permeability of the urachus.

Partial incomplete permeability is more frequent than complete permeability. According to Wurtz, as quoted by Kirmisson, whose investigations were made on 74 cadavers, a bristle introduced along the side of the bladder in the direction of the urachus could be made to penetrate, in 69 cases out of 100, to a depth varying from 2 to 46 mm. Luschka has shown that the urachus, even when it appears to be obliterated, still contains some lacunæ, covered with epithelium of the same character as vesical epithelium. (These cavities are susceptible to dilatation and cyst formation, the history of which is not well known. The only suitable treatment of these cysts, which are incrusted underneath the peritoneum, consists in complete extirpation.) Kirmisson insists on these facts in order to defend the possible, if exceptional, occurrence of a sudden establishment of permeability of the urachus of the adult, caused, for instance, by retention. Delore and Molin contradict this statement with a personal observation on an individual who presented an umbilico-vesical fistula at the age of sixty-three years, which had existed in childhood, remaining latent until the day when retention caused it to reappear.

Early congenital fistulas are seen at the time of birth, or in the days immediately following. Castel collected 35 observations in 1884.

Pathological Anatomy.—These fistulas present for consideration a passage and an umbilical opening. The passage corresponds to the urachus and is shortened by the elevation of the bladder that is usually present. Sometimes the dilated urachus becomes merged into the bladder. The diameters of the passage gradually diminish from the bladder to the umbilicus, in such a way that the permeable urachus presents a general resemblance in shape to a much elongated cone. In an autopsy of Cadell, quoted by Trogneux, there was, at the superior portion of the bladder, an opening leading into the cavity of the unobliterated urachus, large enough to admit the little finger. The urachus extended to the umbilicus, gradually becoming smaller, until finally, at this level, it would admit only a No. 5 or 6 catheter.

The umbilical opening is almost always shaped like a line or dot. It is so situated at the bottom of the umbilical depression and masked by the folds of the cicatrization, that it may be difficult to introduce an instrument, and pass it toward the bladder.

Symptoms and Diagnosis.—The escape of urine through the umbilicus often constitutes the only symptom. The flow may be so scanty as to simulate perspiration, or the urine may escape one drop after another, a regular stream occasionally appearing during the act of micturition.

The diagnosis of urinary fistula is usually assisted and even proved by this escape of fluid, its odor and reaction.

Intestinal fistulas of the umbilicus, arising from the omphalo-mesenteric canal, are also recognized by their secretion, which consists either of mucus or of fecal matter.

Treatment.—The treatment consists of cauterizing the fistulous tract, freshening the fistula and sewing it together; or exposure of the urachus by the median incision, excision of the urachus and fistula and suture of the vesical orifice. This constitutes the radical method of treatment.

(3) **Ectopy of the Intact Bladder.**—This very exceptional deformity consists in an opening in the abdominal wall, through which the bladder protrudes as a rupture (hernia). Arrests in the development of the ventral wall of the body are especially apt to occur in the region of the umbilicus, where the closure of the abdominal cavity takes place last. If the urinary bladder, lying behind such an abdominal cleft, prolapses through it, the condition is designated as ectopia, in contradistinction from exstrophy. The anterior vesical wall is preserved and bounds a mucous blind pouch corresponding to the summit of the bladder.

# CHAPTER XXXVI

## TRAUMATISMS OF THE BLADDER

THE bladder is rarely injured by traumatisms, as it is in an almost inaccessible position, guarded by bony structures and strong fasciæ to a marked degree, except in the suprapubic region. It is therefore not surprising that injuries to the bladder most frequently occur by way of the hypogastrium, especially as the bladder when distended rises above the symphysis. Injuries through the ischiatic, perineal or obturator routes are comparatively rare. A detached or displaced fragment of bone in the case of a fractured pelvis may cause a traumatism of the bladder, that is equally, if not more, dangerous than one due to direct violence. This injury may be caused in the part of the bladder outside of the peritoneum (extraperitoneal) or through the peritoneum (intraperitoneal).

The Bethanien Hospital in Berlin had only 3 instances in eight years in 10,867 surgical cases; St. Bartholomew's in London had but 2 such cases in seven years, while in the statistics of wounds in time of war compiled by Otis there were but 183 cases out of 408,072 wounded.

**Varieties.**—Traumatisms of the bladder are of two classes:

(1) Penetrating wounds.

(2) Subparietal ruptures due to contusion.

PENETRATING WOUNDS.—These are classified as surgical or accidental.

By *surgical* we mean such as when, for the purpose of relieving an attack of retention of urine, a suprapubic puncture is made. This would probably be harmless under aseptic precautions, in case the urine is not infected, the bladder wall is of good tone and the puncture not too large; but if such conditions do not exist, there may be an extravasation of urine through the puncture. It may also be the result of a surgical error in mistaking the bladder for a hernia sac when performing a herniotomy; in which case, the injury may be intra- or extraperitoneal. It may also be due to cutting into the bladder during a laparotomy in case the viscus had not been emptied before the operation, especially if the laparotomy incision is made in the Trendelenburg position. Rupture of the anterior bladder wall may also be due to a pericystitis with strong peritoneal adhesions. In such cases, the effort to push up the peritoneal reflection during a suprapubic cystotomy may result in so much of the bladder wall

coming with it as to cause it to rupture. This has happened to me on two different occasions.

Under *accidental* we include wounds that are inflicted by pointed instruments, such as a knife, dagger, sword or bayonet by a second party, willfully or accidentally; or when the individual is gored by some horned animal, or falls on a stick or other sharp implement. The resistance of the bladder wall, however, usually protects it from any violence inflicted by cutting instruments. By far the most frequent accidental cause is the so-called gunshot wound, meaning the ball from any kind of firearms.

SUBPARIETAL.—The contusions that cause rupture of the bladder may be spontaneous or traumatic.

*Spontaneous Rupture.*—Rupture of this type depends primarily on a disease of the bladder wall, such as a neoplasm, ulcer or a cystitis due to obstruction or a perforating calculus; especially if in such cases a great effort is made by the bladder or abdominal wall to force out the contained urine.

*Traumatic Rupture.*—The *internal* causes are a bladder injection made too violently or when a great quantity of fluid is slowly introduced, causing more distention than the bladder wall can resist.

The *external* causes that rupture the bladder are usually:

Accidents, such as a blow, fall, shock or crush, causing a direct injury, or an indirect traumatism due to a fracture of the pelvis. Undue pressure from without on a diseased or distended bladder may also cause its rupture.

A traumatic rupture of the bladder may also occur during the delivery of a pregnant woman (obstetrical rupture). In this case, the distended organ may be compressed between the resisting uterus and the unyielding abdominal wall, resulting in the rupture of the vesical coats at the point of least resistance. This is exceedingly rare. In the New York Lying-in Hospital, rupture of the bladder has occurred in but 3 in over 50,000 cases.

**Pathological Anatomy.**—A penetrating wound of the bladder is one made by a sharp object that pierces the wall of the body and the bladder as well, a communication consequently existing between the two at the time of the injury.

There are, therefore, three conditions to be considered: The superficial wound, the tract from this to the bladder and the wound in the bladder.

The *wound* of the integument is of variable location. It is generally situated in the hypogastrium, the inguinal region or the perineum, although it may be at a considerable distance from the bladder, especially in the case of a wound made by a bullet.

The *tract* extending from the bladder to the surface wound is often direct, or it was so at the instant when the wound was inflicted, when the wounded part of the distended bladder was in contact with the injured part of the abdominal wall. As soon as the bladder is opened and empties itself, it retracts

and consequently the openings of the abdominal and bladder walls cease to correspond and an intermediate tract is established between the vesical wound and the superficial wound, in which blood, urine, foreign bodies and detached fragments accumulate.

The *vesical wound* usually consists of but one opening. In wounds made by firearms, however, the bladder is generally perforated from side to side, making two openings. The seat of this perforation is dependent on the point of entrance of the projectile.

Subparietal ruptures of the vesical wall exist when the bladder wall is torn through and the vesical cavity is opened without the abdominal wall having been perforated.

The rupture may be single or multiple, nearly always the former. The extent of the tear rarely exceeds five inches. The wound in the bladder may be intra- or extraperitoneal, or both. The peritoneum when torn may be more extensively lacerated than the muscular wall. In extraperitoneal rupture, the tear is in that part of the bladder uncovered by peritoneum and results in a urinary infiltration into the perivesical cellular tissues outside of the peritoneal cavity. In this case, the gravity of the wound is largely dependent upon the occurrence of secondary infection. Urinary infiltration of the tissues as the result of extraperitoneal wounds is harmless when the urine is aseptic; but when the bladder is already infected or when infection follows the injury, a cellulitis develops and a serious septic condition results unless the pus and urine are evacuated.

Intraperitoneal rupture is the most frequent form, resulting in the emptying of the urine into the peritoneal cavity, giving rise to a peritonitis. The bladder injury in the case of a subparietal rupture is usually more extensive than that resulting from a penetrating wound.

Besides the damage to the bladder in cases of penetrating and subparietal injuries, lesions of bone, gut, blood vessels, nerves, genital organs, kidney, ureter, urethra or vagina may occur at the same time as those of the bladder. Of these injuries, those of the gut are the most serious complications. Foreign bodies of various characters resulting from the injuries may remain in the viscus, acting as nuclei for secondary calculi after the bladder has healed. A permanent urinary fistula is another sequel that may exist indefinitely after such an injury.

**Symptoms.**—In many cases, there may be no symptoms pointing to the bladder at the time of the injury, as in the case of a slow leakage into the perivesical region of aseptic urine through a small punctured wound. In other cases, the signs of injuries of the abdominal wall by the presence of punctured or contused wounds are alone noticeable, or else the symptoms may point to some injury of the abdominal cavity other than that of the bladder. It must be remembered that the symptoms, except those resulting from the open wound

and the urinary leakage through it, may be the same in both punctured and subparietal injuries. The shock may be severe or there may be scarcely any at the time of the injury, depending upon the extent, location and force of the fall, blow, thrust or projectile causing the wound. It also depends on whether adjoining tissues have been injured or not.

The bladder symptoms that first call our attention to its injury are a strong desire to urinate, resulting in the voiding of a very small amount of bloody urine, with difficulty and no expulsive force, the act being usually accompanied by tenesmus.

The urine leaking from the bladder in a penetrating wound may show itself on the surface of the body or not, depending on the size, nature and location of the injury.

*Extraperitoneal* wounds are not as severe as intraperitoneal. The area of urinary invasion is more circumscribed and the urine has to gain headway by dissection between the tissue planes. If the wound in the bladder is large and the escape of the urine is not interfered with, we may soon note an area of dullness in the hypogastrium, or perhaps a tumefaction can be outlined. A painful sense of tension may also be present in these cases. When the leakage is slow, through a small or irregular wound, the amount of urine outside the bladder does not accumulate with sufficient rapidity to give rise to painful tension at first, or an appreciable area of dullness. If the urine that leaks out of the bladder into the extraperitoneal tissues is already septic, the absorption of its toxic products will give rise to a septic condition resulting in death unless surgical interference is resorted to. In case the urine leaking from the bladder and infiltrating the tissues is aseptic, it will soon become septic by secondary infection.

The *intraperitoneal* are much more serious than extraperitoneal wounds. The urinary symptoms are the same, but in intraperitoneal both the constitutional and the local symptoms come on more quickly and are much more pronounced. Here there is no tissue resistance to the escape of the urine, which leaks into the peritoneal cavity much more rapidly than when dissecting up between the peritoneum and the tissues outside of it in extraperitoneal cases. A peritonitis quickly develops, attended by abdominal distention, a rapid pulse, a high temperature, followed by abdominal pain, vomiting and death usually in a few days in case no operation is resorted to. Occasionally, however, patients live for a surprisingly long time, as a month or more; but such cases are exceedingly rare. Vesico-vaginal, vesico-rectal and vesico-cutaneous fistulas sometimes follow bullet wounds of the bladder, but rarely result from incised wounds.

**Diagnosis.**—This depends on the seat of injury, the escape of urine from the wound, hematuria, the frequent passage of a small amount of urine and the presence of very little urine in the bladder.

A direct external wound over the bladder usually points to this viscus as the seat of the injury, although a bullet may reach the bladder after entering the body at a distance from the hypogastrium after having pursued a tortuous curve in the abdomen.

The escape of urine from the wound is, of course, a direct proof that the bladder has been injured; but this symptom may be absent or intermittent. The presence of hematuria, especially after an injury, always indicates a lesion of the urinary apparatus, whereas if it is associated with a frequent desire to urinate and the passage of a small amount with difficulty, the typical clinical picture of a ruptured bladder is presented. Very often there is great distress, but no urine is passed and the condition may be mistaken for retention. The catheterization of the bladder, with the result of obtaining only a small amount of bloody urine, will point to the absence of retention and the presence of rupture of the bladder.

A further test can be made by the injection of a certain amount of an aseptic fluid, comparing the amount injected with the amount and character of the fluid escaping, as a diminished amount of the returned fluid mixed with urine and blood will indicate a ruptured bladder.

**Prognosis.**—(1) In extraperitoneal cases, the wounds of the bladder, after they have been closed and a drain passed down to the vesical wall, usually heal promptly by primary union; although, in the case of septic bladders, too much surgical interference may give rise to a fatal peritonitis.

(2) Untreated intraperitoneal wounds, both punctured and subparietal, are absolutely fatal, and even if the patients are promptly treated when peritoneal and intestinal complications are present, they are fatal. Ureteral and renal complications are extremely dangerous.

Scientific operative treatment, promptly adopted, modifies somewhat the gravity of these conditions, although they are always very serious.

**Treatment.**—The cardinal points to be remembered in the treatment of wounds of the bladder are: (1) Place a retained catheter in the bladder; (2) give a urinary antiseptic; (3) open the abdominal wall and explore the bladder thoroughly and (4) close the vesical wound and clean thoroughly the tissues about the ruptured area and establish good drainage down to the wound in the bladder wall.

As soon as the diagnosis of a wound in the bladder accompanied by urinary leakage has been established, a catheter should be inserted into the bladder to be retained. The patient should be given fifteen grains of urotropin three times a day and operative procedures should be resorted to at once. The patient is placed in the flat dorsal position (not Trendelenburg) and an incision made just over the pubes down to the peritoneum. When the prevesical space is reached, if the injury is extraperitoneal, the accumulation of blood and urine will escape and the rent in the bladder wall can be seen. In case it cannot

easily be found, a metal catheter should be inserted into the bladder and its wall then put on the stretch, when the rent can generally be plainly seen. In case, however, it cannot be detected, a solution should be injected through the catheter and the point of leakage noted. The rent having been exposed, a blunt hook should be caught in it and that part of the bladder should be pulled up into the operative field. The forefinger should then be introduced into the bladder and its wall should be palpated with the object of detecting some rent in the viscus other than the one already found.

The blood and urine should be mopped up and any pieces of bone or foreign bodies removed. If the rent does not extend through the peritoneum, it should be closed by interrupted sutures and the prevesical space drained.

In case the tear is *extraperitoneal,* behind the bladder rather than in front, it would be prudent to make first an incision through the perineum up to this postvesical space and insert a catheter for drainage. It is highly improbable, however, that a wound of the bladder in this locality would ever occur except when inflicted by a sharp weapon or a bullet, and I mention it as a remote possibility. The drainage of this space through a perineal opening would result either in the wound in the bladder completely healing or else leaving a small fistula. The fistula could be operated later.

*Intraperitoneal* operations are more important than extraperitoneal. The patient should be flat in the dorsal position. The abdominal wall should be opened down to the peritoneum. The extraperitoneal space should be carefully examined as just described and, if nothing is found, the peritoneum should be cut through the median line, vertically.

The tear is looked for and, when found, is pulled up by a blunt hook and the abdominal contents are walled off by a pad. Douglas's pouch is now mopped out and cleaned. Peroxid should be used for cleansing it, to be followed by salt solution. The bladder tear is united with a double row of Lembert sutures.

In case the rent is *both extra- and intraperitoneal,* as in Fig. 522, the intraperitoneal part should be sutured first and then the extraperitoneal; after which a drain should be kept inserted down to the bladder wall. A soft-rubber catheter should be passed into the bladder through the urethra and left as drainage. For the first few days, the drainage from the catheter should be continuous; after this, the catheter should be plugged and the plug removed at intervals to allow the escape of the urine at first every hour, then every two hours. The patient can usually urinate without leakage at the end of the week. Urotropin should be given three times a day during convalescence.

In case of a rupture of the urethra occurring at the same time, a perineal urethrotomy should be performed in addition to the bladder operation.

When a fracture of the pelvis causes a rupture of the bladder, the condition is very serious.

In the case of gunshot wounds of the bladder or injuries due to puncture or incision, the intestines must be carefully examined for injuries and, if present, they should be promptly repaired.

The accidental cutting of the bladder in hernia will be considered under Hernia of the Bladder in the next chapter.

The technique of the operations for vesical injuries will be taken up in the chapter on Bladder Operations.

# CHAPTER XXXVII

## HERNIA OF THE BLADDER

HERNIA of the bladder consists of a protrusion of a portion of the bladder wall through the abdomen or pelvis by way of a natural or accidental orifice.

**Varieties.**—The varieties are: (1) Inguinal, (2) crural, (3) perineal, (4) vaginal, (5) urethral (inversion of the bladder).

Our knowledge of these forms of hernia has gradually increased with the advance in abdominal and pelvic surgery as well as with that of hernia in general. It is probable, however, that our own mistakes and those of our colleagues in accidentally cutting into these protrusions while operating for hernia, have been the chief means of impressing us with their occasional existence.

A vesical hernia may consist of the extraperitoneal portion of the organ, in which case it has no sac and is, literally speaking, a prolapse of a part of the viscus. In other cases, it may be the intraperitoneal portion of the bladder, when it will have a sac. It may also be both extra- and intraperitoneal, in which case part of the bladder will be in the sac and the remainder outside of it.

A hernia of the bladder is often spoken of as primary or secondary. In the former case, a protrusion of the bladder occurs alone, while in the second case a preëxisting hernia, consisting of gut and omentum, during its development has pulled the bladder wall down with it. A primary hernia is, therefore, more likely to consist of an extraperitoneal part of the bladder and a secondary hernia of an intraperitoneal portion.

Hernia of the bladder is much more frequent in men than in women, at least three quarters of the cases occurring in the former. It is usually found in advanced life and but rarely in children.

**Etiology.**—A certain predisposition to vesical hernia is established by the increasing distention and thinning of the bladder walls, as well as by the greater laxity of the inguinal and other canals and rings. Such a condition is often brought on by prostatic hypertrophy, urethral stricture or pelvic tumors. When the bladder hernia is secondary to that of omentum or gut, the viscus is usually firmly adherent to the peritoneum covering the vesical wall, and consequently drags that portion of the bladder with it into the hernia sac during its descent; whereas if no adhesions were present it would simply slip from its

position beside the bladder into the sac and leave the vesical wall undisturbed. A pericystitis would therefore favor such a condition.

**Inguinal Hernia of the Bladder.**—This form is almost always unilateral. It is extremely variable in volume, but never includes the entire bladder. The part of the bladder herniated may not be covered with peritoneum, in which case there is no sac present and the vesical wall may be itself mistaken for the sac and cut into. The protruding part of the bladder may be entirely covered with peritoneum, in which case the sac will be complete and the danger of mistaking the bladder wall for a sac and cutting through it will be lessened. In cases of extraperitoneal hernia, the bladder alone will protrude; while, in cases of partial or complete intraperitoneal hernia, any of the peritoneal contents usually found in inguinal hernia may be present, such as omentum, small intestine, large intestine, also at times the appendix. The tube and ovary have been found lying beside a herniated bladder. The bladder hernia may be both intra- and extraperitoneal, in which case part of the protruding bladder has no sac; whereas the other part is in a sac either alone or together with other viscera. Fig. 431 shows a hernia sac containing a loop of intestine above and a piece of bladder below; whereas, just under the sac, another piece of bladder is seen. The two pieces of bladder are continuous, one outside and the other inside the peritoneal fold.

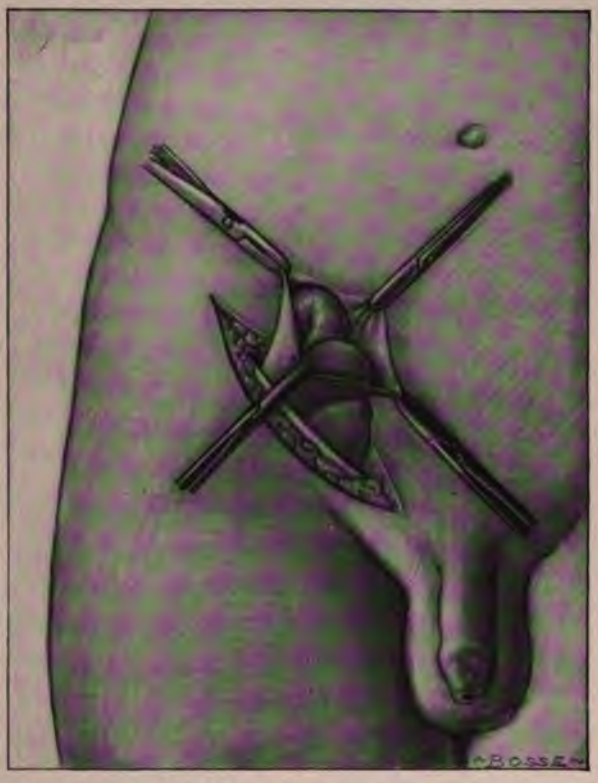

Fig. 431.—A Combined Extra- and Intraperitoneal Bladder Hernia. The sac is held open by forceps. The picture is a combination of three hernias from above downward. They are intestinal, a bladder intraperitoneal, and a bladder extraperitoneal, one of which usually occurs alone. (Author's case.)

Symptoms.—These may be divided into physical signs and functional disturbances. Bladder hernias in the inguinal region are usually bubonoceles, that is, they are generally confined to the groin. They vary in size at different times, and, if closely observed, it may be noticed that this variation is in close

relation to the filling and emptying of the bladder. When the bladder is distended by urine, the tumor feels fairly tense and may fluctuate; but when a small amount of fluid is present, it is soft and pasty to the touch and, in cases in which no urine is present, only a slight thickening may be noticed.

There is frequently pain in the form of colic, radiating toward the abdomen or lumbar region. Micturition is generally increased in frequency; pressure on the inguinal pouch may increase the amount passed at any one time. The urine may be clear and normal, or cloudy and purulent, depending on whether the bladder is infected or not.

Course and Complications.—Vesical hernia is only serious when it causes renal involvement, due to traction of the ureters, or reno-vesical infection. Various complications may occur, such as adhesions, rendering the hernia irreducible. Strangulation of the prolapsed portion of the bladder may also take place, attended by pain, hiccough, vomiting and other symptoms resembling those of incarcerated intestinal hernia. Calculus has been observed to form in the pouch of a retained hernia in rare instances as the result of urinary stagnation.

Diagnosis.—The diagnosis of inguinal hernia of the bladder may be easy, as in cases where all the signs and symptoms are present. Generally, however, there is nothing to suggest it until the actual condition is discovered at the time of the operation, by the peculiar configuration of the tumor. Several ways have been proposed for distinguishing the bladder from other viscera usually contained in a hernia, such as omentum or intestine, but the differentiation is not always practicable. The extraperitoneal portion of the bladder wall is often mistaken for a hernial sac. It is, however, more thickly covered with fat than a sac, the bladder wall is also thicker and has not the same membranous appearance. When there is a combined extra- and intraperitoneal hernia, the portion of the bladder outside of the peritoneum may be mistaken for tissue which has become adherent to the sac. If the sac is held up and the finger inserted into it, it will be easily seen that the tissues above and below the peritoneum are the same and are consequently both bladder. Should additional proof be required, a sound can be passed into the interior of the organ and pressed against the side in question. If the hernia is altogether intraperitoneal, it is easy to distinguish bladder from other viscera: Omentum can be pulled out as a large mass without a cavity, small intestine can be pulled up, showing the mesentery; large intestine will show the longitudinal bands; in fact, there is no plain thickened tissue in the abdominal cavity in this locality that can be mistaken for the bladder. The mistakes that are made by surgeons are: Taking the bulging of an extraperitoneal protrusion for a sac and cutting into it; or else taking the extraperitoneal protrusion for some tissue adherent to the bladder and cutting into it when trying to separate it from the sac. In case the bladder has been accidentally incised, the wound margins should be closed

by suture, usually the Lembert variety, followed by the introduction of a retention catheter into the bladder.

PROGNOSIS.—The prognosis of inguinal hernia of the bladder, if left alone, is not serious, unless through a disease of the bladder or kidney that it may give rise to; otherwise, it is simply an inconvenience to the patient. An associated intestinal hernia may be dangerous on account of possible strangulation. The accidental cutting of a bladder wall, mistaken for a sac or an adhesion to a sac, is not usually dangerous, because it is extraperitoneal. The intraperitoneal portion of the bladder would not be cut into accidentally any more than small or large intestine. The only indication in performing a hernia operation is to free and ligate the sac, and not to incise the contents.

TREATMENT.—The treatment of vesical hernia is simple. A truss can be worn, the same as for any other hernia, which will push the bladder back in place and prevent its further protrusion.

A radical operation is the best. In the extraperitoneal type, the hernia is direct and there is no sac; in which case it is simply necessary to free the herniated portion of the bladder and reduce it, and then having done this to close the floor of the inguinal canal, by uniting firmly the conjoined tendon to Poupart's ligament. In the intraperitoneal type, the sac of the hernia is opened, the bladder is pushed back into the peritoneal cavity, a purse-string suture is placed about the neck of the sac, drawn taut and ligated and the redundancy of the sac cut away, after which the stump should be anchored to the wall of the parietal peritoneum above the hernia opening as in any other case of inguinal hernia. If the hernia is both extra- and intraperitoneal, the two parts can be operated on as already indicated.

ILLUSTRATIVE CASES.—In the case of a laborer, aged twenty-five years, who came under treatment in the Columbus Hospital for a bubonocele on the right side, the sac was found and opened. It was very thick and fatty and contained intestines and omentum. In clearing it up so as to have the neck well exposed to apply a purse-string suture, a redundancy was seen outside of it which appeared to be very adherent. In an effort to dissect this away, the knife went into a cavity. There was a small extraperitoneal hernia of the bladder, associated with an intraperitoneal hernia of the bladder and omentum. The bladder incision was closed with Lembert sutures, a catheter *à demeure* was inserted through the urethra and orders were given to watch carefully that it did not slip out and the drainage be uninterrupted. The following day, on seeing the patient, I was informed that the catheter had come out during the night, due to the patient having tossed about considerably. The doctor had inserted it again and found over twenty ounces of urine present. There had been no leakage of urine. The patient made an uneventful recovery. The efficacy of the Lembert suture in bladder cases is well illustrated by this observation.

Another patient, fifty-eight years of age, in the Manhattan State Hospital, had a small inguinal hernia (bubonocele). On opening the inguinal canal, a mass of fat was seen, with the cord passing through it. I felt that a mistake had been made, as the condition appeared like a lipoma of the cord. In dissecting the fat, however, a small bladder hernia was discovered, which was extraperitoneal. It was pushed back in place and the conjoined tendon and Poupart's ligament sewed tightly together.

I have had a number of cases of inguinal bladder hernia in a large hernia service at the Columbus Hospital and so far have cut but one bladder.

**Crural Hernia of the Bladder.**—This is a rare condition and I have had but one such case. It occurred in a man whose history I give below. In the case of a female patient having a small reducible protrusion with a thick fatty wall and the characteristic feel of a vesical hernia, I simply pushed the mass back and closed the crural canal. The hernia was not much larger than a good-sized hickory nut and I did not feel justified in increasing the size of the wound by an exploratory incision for the sake of satisfying diagnostic curiosity. On the occasion of a meeting of the Genito-Urinary Section of the New York Academy of Medicine at which I presided, Dr. G. F. Shiels, of this city, read a paper on the subject, and, of the twenty men present, one had had a similar case and another had had two such cases.

Causes.—The causes of crural hernia of the bladder are the same in general as those of inguinal hernia. The larger transverse diameter of the female pelvis renders it more liable to take place in this sex than in the male. Pelvic exudates, hematomas and tumors of the pelvis also predispose to the development of crural hernias in the female. They usually occur on the right side, are generally small, and it is only in exceptional cases that more than one third of the bladder is involved.

Symptoms.—The symptoms of crural hernia are practically the same as those of inguinal hernia of the bladder. The diagnosis is the same except that a sound in the bladder is not of so much diagnostic value. The occurrence of secondary hernia is rare. The condition is more often extraperitoneal. The bladder is more frequently adherent to the sides of the canal; in fact, so intimately that it is often impossible to replace the viscus without great danger of injuring the femoral vein. It is frequently irreducible.

Treatment.—The treatment is operative. An incision is made over the crural canal as in any other variety of hernia of this type. The mass is covered by layers of fat, as in inguinal hernia, and an attempt at reduction is made. After reduction the canal should be closed as in other cases. In irreducible cases, a purse-string suture should be tied around the neck of the protrusion, as far back as possible, the redundant portion cut away and the edges of the crural canal brought together, in this way holding a firm plug of tissue in place. Hernias of the intraperitoneal type should be reduced and the sac tied with a

purse-string suture, after which the canal is closed, as in the case of any other crural hernia.

Illustrative Case.—The patient, a porter, fifty-two years of age, complained of a lump in the right crural region, which, when he was lifting, occasionally gave rise to a sensation as if something was being pulled upon. Examination revealed a small hernia over Poupart's ligament. An incision made over it revealed a mass of fat, which was traced down to the crural canal. There were several layers of thick fat, and finally a thick, tough tissue was reached which proved to be the bladder. It protruded for about an inch and a half and was irreducible. I purposely opened it, put a purse-string suture about it and cut off the redundancy (Fig. 432). In this case, I refrained from dissecting off the bladder, for fear of injuring the femoral vein. The patient had slight hematuria afterwards. Cystoscopic examination revealed a dark corrugated area at the point of the resection. When the patient left the hospital, the pulling sensation still persisted.

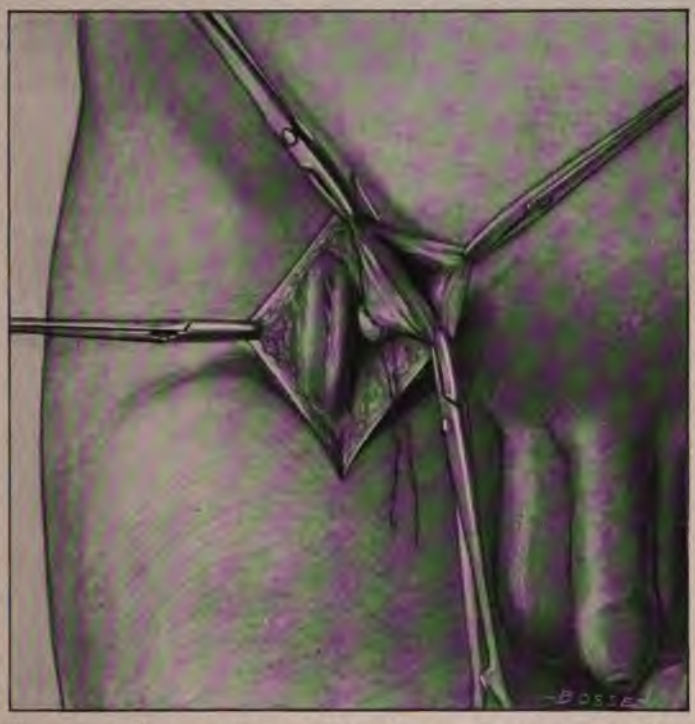

Fig. 432.—A Femoral (Crural) Hernia of the Bladder with a Ligature About the Constriction and the Femoral Vessels Beside It. (Author's case.)

**Perineal and Vaginal Hernias of the Bladder.**—Perineal and vaginal hernias of the bladder are very rare. They are usually due to pregnancy and parturition, or are the result of traumatism. In the male, a soft reducible tumor may protrude from the perineum in the median line, or from one of the sides of the raphe. In the female, in rare cases, a piece of bladder may descend into the labium majus as a labial hernia of the bladder. After reducing the tumor, one may feel with the finger the orifice through which it has made its escape. In a very old case, operated by Hartmann, the tumor presented in the inferior portion of the labia majora and contained a calculus weighing three ounces.

The treatment of these conditions generally consists in palliative ures, such as the wearing of a specially designed truss or bandage. No operation has been formed as far as I c certain. I have ha case of vaginal her woman fifty years o following upon a hy tomy, in which the der, a loop of small tine and a portion rectum were herniated 433). In this case tempted, through a rotomy incision, to br and support the v vault. Not being s ful, I closed the v entrance.

FIG. 433.—A VAGINAL HERNIA CONTAINING BLADDER (*B*), SMALL INTESTINE (*S I*), AND RECTUM (*R*). (Author's case.)

**Urethral Hernia Bladder.**—Urethral of the bladder or lapse of the inverted through the urethra, sible only in the sex, where it has be served as a congenit nia through an abno large urethra. The dition is of exceptio currence in adult lif majority of reported having been children. The bladder may be inverted partially with tion of the vesical mucosa, or the inversion may comprise all the laye mucous surface presenting as a purplish tumor at the urethral orifice. prolapse is usually about the size of a walnut, having an elastic feel, a be returned through the urethra, manually or with the aid of instru The patient's pelvis should be elevated during the necessary manipu and general anesthesia is often required. Tamponing of the vagina ha found useful in the after-treatment.

**Cystocele.**—Cystocele cannot be considered a bladder hernia, but prolapse of the bladder that is associated with an injury to the pelvic flo

ing parturition and a prolapse of the uterus. In its descent the uterus drags or pushes down the bladder.

The condition of the bladder produced is something like that in prostatic hypertrophy. There is an extra strain brought upon the vesical muscles in an effort to void all the urine present in the bladder. A pouch develops in the lower posterior part of the bladder and a partial retention of urine is present. The bladder becomes trabeculated and its walls thinned in the region of the pouch.

The SYMPTOMS are a bearing-down feeling in the bladder, frequent and difficult urination and in some cases dribbling. Cystitis frequently develops and stones sometimes form, in which case the symptoms are aggravated.

TREATMENT.—The treatment is surgical and consists in repairing the pelvic floor and in treating the uterine condition present. The anterior wall of the vagina is freshened or dissected away, sometimes down to the muscular wall of the bladder, and a "V," oval or diamond-shaped denuded space is left, the edges of which are brought together with sutures. (See Uterine Prolapse and Cystocele in the chapter on Bladder Disturbances Due to External Causes.)

# CHAPTER XXXVIII

## CYSTITIS

### (*Inflammation of the Bladder*)

Our knowledge of cystitis has changed considerably during the last twenty years, owing to a better acquaintance with the urinary organs, on account of cystoscopic and urethroscopic examinations, ureteral catheterization and more thorough urinary analysis. There are, however, various teachings and doctrines that have been handed down from generation to generation which do not agree with our present view of the subject, most of which have been omitted from this chapter in my effort to make it as practical as possible.

**Classification.**—Cystitis has been classified in various ways: According to the degree of inflammation (acute, subacute, or chronic); according to the pathology (superficial or catarrhal, interstitial, pericystitic); according to the symptoms (purulent, hemorrhagic, granular, membranous, gangrenous); or according to the etiology (ascending, descending, obstructive, gonorrheal, tuberculous, tumor, paretic, paralytic). My aim is to describe cystitis in a clinical way and therefore to discuss the degree and cause of the inflammation. The various types will be considered symptomatically.

For a long time, cystitis was regarded as a condition in which there was pain on urination and pus in the urine. A posterior urethritis was interpreted as a cystitis, as was often frequency of urination from other causes associated with pain and pus in the urine coming from the kidneys; whereas ulcers of the bladder and tuberculosis were considered interstitial cystitis. I shall try to eliminate these inheritances of the past, which do not coincide with our present findings, and treat of the condition as it appears to me.

**Etiology.**—In order to have cystitis, both predisposing and active causes are necessary. The predisposing causes are certain conditions which tend to produce congestion, as this provides a favorable soil for infection. Congestion of the bladder is usually brought about in the following ways:

First, and rarely, by certain internal medicines in too large doses, such as cantharides, turpentine, copaiba, sandalwood oil and alcoholic drinks.

Second, by local remedies in too strong solutions, such as bichlorid of mercury, carbolic acid, zinc chlorid, nitrate of silver and many others.

Third, by traumatism. This may result from bladder injuries due to contusions when the organ is full; to fracture of the pelvic bones; or it may be due to instrumentation in examining or treating the bladder, such as a very hot cystoscopic lamp, manipulations with a cystoscope in the bladder, or the crushing of a vesical calculus.

Retention of urine also tends to produce congestion. When the bladder is distended and full, the urine pressing upon its walls compresses the blood vessels; but when the bladder is emptied and the retention relieved, the blood vessels become engorged. A complete retention may be due to an obstruction to the flow of urine, as a stricture, an enlarged prostate or a calculus in the urethra. An incomplete retention, that is, a certain amount of residual urine in the bladder that cannot be passed out, is also a predisposing cause, whether this be due to an obstruction or to an atonic condition of the bladder wall as a result of disease of the brain or spinal cord.

Muscular contraction also produces congestion in the effort to force urine through an obstructed canal in cases of an enlarged prostate or urethral stricture. The irritation of a stone in the bladder brings on a congestion on account of the mechanical irritation and as the result of trauma. A tumor of the bladder or tuberculous lesions are accompanied by an extra amount of blood, thus producing a congestion in the affected part of the bladder wall. Exposure to cold, wetting or chilling the feet or lower extremities may also cause a congestion of the bladder. An irritating urine, such as that of oxaluria, uric-acidemia or ammoniacal fermentation, is another cause. Increased sexual excitement also predisposes to vesical congestion and inflammation.

Any abnormal condition of the abdominal or pelvic organic tissues coming in contact with the outside of the bladder and interfering with its function through pulling, pushing, or pressing upon it predisposes to cystitis. In such a case, besides any inflammatory condition which may be present in the adjoining tissues that predisposes to cystitis, the extra work of the bladder wall in its effort to overcome these interferences brings an extra amount of blood to the bladder, thus producing congestion. These conditions are displacements, tumors, or inflammation of the uterus; displacements, tumors or cysts of the ovary; inflammation of the tubes or adhesions of the tubes to the bladder or to other tissues that they drag and hold against the bladder; exudates and collection of blood or pus in front, behind or on the side of the uterus, adhesions of the omentum or gut to the bladder, etc.

The active cause of cystitis is infection. The germs producing this infection may be the colon bacillus, staphylococcus, streptococcus, the gonococcus, the tubercle bacillus, the pneumococcus, the Proteus vulgaris and the Urobacillus liquefacius septicus.

The entrance of the infection takes place: First, by the descending route from the kidney; second, by the hematogenous route, through the circulation;

third, by direct propagation up the urethra (ascending route); or fourth, direct entrance from adjacent organs.

When the infection descends from the kidney, a suppurative process n exist in that organ, and the pus-producing germs may come down with urine, or the microörganisms may be carried through the circulation to a heal kidney and be excreted in the urine, without producing a renal infection. either case, the germs will enter the bladder and may infect it. Pus-produc germs in the circulating blood may pass through the bladder wall and give ris cystitis in a similar way. Their passage through a normal bladder would not sult in inflammatory changes, but, in the presence of congestion due to the abo mentioned causes, the germs find a soil eminently suitable for their developme

The infection may also be due to direct urethral extension upward in case of gonorrheal urethritis, or to other germs that reside habitually in urethra. Such an infection may be spontaneous, when the germs simply asce and infect the bladder, or it may be instrumental, when they are carried in a catheter or other instrument which is passed through the urethra into bladder. When the tissues are normal, the ordinary microbes of the uret will rarely cause a vesical inflammation, but congestive changes in the blad wall favor and increase the virulence of the invading bacteria.

Direct extension of infection probably takes place from adjacent tissues organs, especially the rectum, although this has never been positively dem strated. It is known, however, that cystitis is more prone to occur in the pr ence of rectal disease, especially hemorrhoids or ulcerations.

**Pathology.**—An *acutely* inflamed bladder wall presents a reddened a edematous appearance, with dilated and engorged blood vessels, which are b seen at the vesical neck. The inflammat process begins at the trigone, but may volve the entire mucous membrane. Lo ized erosions are common in the sev cases, as are small ulcers.

FIG. 434.—CYSTOPHOTOGRAPH OF TRABECULÆ AND DIVERTICULA (POUCHES). (Nitze.)

In inflammation of a chronic charac the vesical wall is lighter-colored and sumes a yellowish or gray appearan Marked dilatation of the blood vessels a localized areas of redness are noticed, pecially about the trigone. The blad wall is at first thickened, resulting in formation of strands running across bladder, resembling roots in swampy grou called trabeculæ. The bladder wall between these trabeculæ, especially in ca of obstruction, becomes thinned and dilated. These spaces are called divertic (Fig. 434). Occasionally, some of these diverticula reach a large size and

called pouches, in which calculi may be present (Fig. 435). Erosions are sometimes found, as in acute cases. They may be covered with muco-pus, or with phosphatic deposits when the urine is alkaline. Large sheets of pseudomembrane

FIG. 435.—CYSTITIS WITH POUCHES (DIVERTICULA). (Desnos.)

with waving shreds, consisting of mucus, pus and vesical epithelia, are often seen, through the cystoscope, adherent to the bladder wall. There is also a considerable thickening of the bladder wall in cases of vesical calculus and in tumor, but the wall is very much thinned out in the atonic bladders of paralytics. In obstructive cystitis, the bladder becomes first hypertrophied and later dilated, due to the increasing amount of residual urine, giving rise at times to urinary incontinence from vesical atony.

The bladders of *interstitial cystitis* are thickened and shrunken; the inflammation in these cases has extended deeply into the muscular wall, with especial involvement of the interstitial tissue. In this form of cystitis, there are at certain periods of the process small abscesses in the bladder wall that break into the bladder cavity, although they may give rise to an inflammation outside of that organ (pericystitis). Such bladders are capable of distention but to a limited degree, and the vesical mucosa consequently appears thicker and redder. I believe most of these bladders to be the result of tuberculosis and ulcers, and that otherwise such a condition is extremely rare.

*Gonorrheal cystitis* may involve a part or the whole of the trigone, but the remainder of the bladder is usually not involved. It is extremely rare and inflammation of the bladder following a gonococcal urethritis is usually due to other germs than the gonococcus.

In *granular cystitis,* the inflammatory process extends up from the urethral orifice, covering the prostatic base, the trigone and the paratrigonal space. The granulations are usually bathed in pus, and are probably the result of an extension of a posterior urethritis into the bladder. It is rare.

*Nodular cystitis,* first described by Alexander, is characterized by a studding of the bladder surface with small scattered nodules made up of vascular and lymphatic tissue. It is also rare.

*Pressure* from without upon the bladder, by tumors in the surrounding tissues or inflammatory adhesions to the organ, may cause the appearance of small circumscribed vesicles on the bladder wall, known as edema bullosum.

*Membranous* and *diphtheritic cystitis* are practically identical. A portion of the bladder becomes covered with a membrane, composed of epithelia, muco-

FIG. 436.—A LARGE ROLLED-UP CAST OF MEMBRANE FROM THE BLADDER PASSED BY THE URETHRA. Three fourths actual size. (Author's case.)

pus and fibrin, which may be passed in the urine in small shreds or as a large rolled-up cast (Fig. 436). These membranes either resemble typical diphtheritic membranes or they may be thicker and of a yellow color.

Gangrene of the bladder is an extremely rare condition, and consists of sloughing of the vesical mucosa, sometimes down to the muscular layer. It does not occur outside of carcinomatous disease of the organ, or in connection with severe traumatism or general sepsis.

**Symptoms.**—The clinical course of cystitis may be either acute or chronic.

ACUTE CYSTITIS.—In acute cystitis, there are three cardinal symptoms: Frequency of urination, pain and pus in the urine.

The *frequency* may be very great, as often as every quarter or half hour during the night and day, accompanied by tenesmus, a cramplike distress at the neck of the bladder after the urine has been voided. A burning sensation sometimes accompanies and follows the act, and is due to compression of the congested blood vessels around the vesical orifice. The urine is highly colored, usually acid, and contains pus, bladder epithelia and mucus.

There is *pain* in the suprapubic region, in the perineum or at the junction of the glans penis with the corpora cavernosa, during micturition or when the bladder is at rest. It is rare for pain to be present in all these localities at the same time. Pain situated in the hypogastric region may be present independently of urination; pain in the glans generally manifests itself during urination; while the pain in the vesical neck usually occurs at the end of micturition. Tenderness on pressure of the vesical wall is frequently present. Pus is always present in variable quantities in true cystitis.

The acute exacerbations of chronic cystitis give rise to the same severe symptoms. Such cases may be associated with a low fever of from 99° to 100° F., and a slight elevation of the pulse.

Chronic Cystitis.—The symptoms of chronic cystitis are the same as those of the acute type of inflammation, except that they are milder in character. They consist in: Frequency of urination, pain, muscular spasm, tenesmus, pyuria, hematuria and fever. Sometimes there are no subjective symptoms present.

*Frequency of urination* is due to the congestion and the consequent irritability of the sensory nerve terminals in the bladder. The result of this is that when a certain amount of urine has accumulated in the organ, the pressure of the fluid increases the irritability of the nerve terminals and a desire to urinate is experienced. Sometimes this desire to urinate comes on so suddenly that it is almost impossible for the patient to reach a suitable locality, and when such a place is reached the urine spurts out almost instantly. This is called precipitate urination.

Posture has a considerable influence upon the degree of frequency. When the patient stands or walks, the urine gravitates toward the vesical neck, at which point the inflammation is most acute, and the desire is, therefore, produced more often. The condition is also aggravated by exercise and by jolting. When the patient is in a sitting posture and the bladder is at rest, the desire does not come on so frequently. When lying down, the urine gravitates away from the vesical neck and the patient can hold his urine longer.

Frequency of urination also depends upon the pathological lesions in the bladder. If there is an erosion or ulcer near the margin of the sphincter, the bladder is much more irritable and the desire more frequent and intense. It may therefore be said that frequency of urination depends upon the cause of the cystitis. If it is due to a stricture, it is frequent during the day, but not

so frequent at night. In stricture cases, there is considerable congestion and inflammation behind the lesion, especially if the narrowing is a deep-seated one. This inflammation frequently extends to the neck of the bladder. Sometimes the sphincter muscle at the vesical neck becomes atonic and urine leaks into the posterior urethra. In stricture cases, the urine gravitates away from the orifice of the bladder at night, and the frequency of urination is less marked than during the day.

Stone is also an obstruction giving rise to frequency. It generally tends to gravitate to the lowest point of the bladder when the patient is standing, and, if it is of a certain shape and size, it will engage in the bladder opening and cause great irritation, especially when it has a rough exterior, as the calcium oxalate variety. In stone cases, the frequency of urination is not so marked during the night, as the stone and the urine both gravitate away from the sensitive vesical neck.

Enlarged prostate is another cause of obstructed urination. But in these cases the desire to urinate is as a rule relatively more frequent during the night than during the day, as the circulation is less active when the patient is not moving about and thus exercising the perineal muscles. The result of this is a considerable passive congestion due to the anatomical relations of the vessels about and above the prostate gland.

In the paretic or paralytic form of cystitis, in which the bladder is atonic, the sensory nerve fibers are not as sensitive and the desire to urinate is not acute. In fact, it may be a sensation of weight and distention that notifies the patient that it is time to empty the bladder. Frequently, however, these patients have retention and an incontinence due to overflow retention.

Frequency of urination is probably most marked in cystitis due to tuberculosis, especially if there are ulcerations near the bladder sphincter. It is about equally marked day and night.

A patient with chronic cystitis usually urinates every one or two hours during the day and perhaps once or twice at night, the relative frequency between the day and night depending upon the causes above enumerated.

Acute exacerbations of a chronic cystitis, accompanied by pain and tenesmus, cause increased frequency of urination, similar to an attack of acute cystitis, that may last from a few hours to a few days. Exacerbations are really acute attacks of cystitis occurring during a chronic process. They are brought on by wetting the feet or chilling the extremities, by excesses in eating and drinking and sexual intercourse and are due to an increased congestion at the neck of the bladder.

The *pain* in chronic cystitis is of a varying character. It may be most marked in front over the pubes, especially if pericystitis is present there. In most cases, it is more marked in the perineum or in the glans, depending upon the cause. The character of the pain may be dull or burning. Burning pain

is more frequently found in exacerbations, or in the presence of a stone or of ulcerations near the vesical sphincter due to tuberculosis or other causes, and also in cases of prostatic hypertrophy. These same causes also give rise to pain in the glans penis when there is an intense congestion about the vesical orifice.

*Tenesmus* or *muscular spasms* often accompany pain situated in the perineum due to a congestion of the vesical neck, especially in cases of stone, stricture and ulceration. Tuberculous ulcers probably give rise to more tenesmus than any other variety. The worst cases of muscular spasm and tenesmus that I have ever seen, however, occurred in patients with tuberculosis, stone and stricture. Some of these patients were obliged to squat when urinating, and the pain and straining were so great that an inch or more of the rectum prolapsed at each act of micturition. Strangury may accompany the painful and spasmodic character of urination.

*Pyuria* is always present in chronic cystitis. It is most marked in patients who have a certain amount of residual urine, that is, in cases of obstruction, such as in stricture or enlarged prostate; in lesions of the cord, such as in locomotor ataxia and lateral sclerosis; or in vesical calculus.

The urine in these cases is usually alkaline and ammoniacal. When the urine is passed, it tends to precipitate and form a jellylike mass on the bottom of the vessel. This is due to the action of microörganisms on the urea, giving rise to urinary decomposition and to the production of ammonium carbonate. Such urine irritates the bladder and aggravates the symptoms.

*Hematuria* is a frequent symptom of chronic cystitis and points to a grave form of disease. The blood in vesical hematuria is mixed with the urine, although not as closely as in hematuria from the kidney. There are also small clots in the urine, while sometimes large clots form in the bladder that cannot be passed. Hematuria is principally seen in cases of tumor, stone, ulcer and tuberculosis.

The hemorrhage is sometimes so constant and so abundant that the condition is spoken of as hemorrhagic cystitis. This was formerly considered as a variety of inflammation of the bladder, and classified as interstitial, when the bladder held only a small amount of urine. It is, however, generally due to a cystitis associated with a tumor, stone or tuberculosis. The cases in which the bladder holds the smallest amount of urine are generally the tuberculous. Very often it will hold only an ounce or an ounce and a half, and the introduction of an increased amount will cause hematuria. These bladders often do not dilate under ether given the patient in sufficient amount to produce an operative anesthesia, and a larger quantity would be dangerous to life; whereas, the same bladder a few weeks before may have been able to hold eight to fourteen ounces of urine. Such cases were formerly spoken of as hemorrhagic or interstitial cystitis.

In cases of vesical tumor, the blood, pus and urine that come from the blad-

der are often so mixed as to resemble a thick sirupy fluid, so characteristic of tumor that I have made a diagnosis from its inspection.

Constitutional Symptoms.—A patient with cystitis may suffer from general debility, with depression, and show some cachexia. Fever, however, is not constant, although it may occur to a slight degree when acute exacerbations are present. For a long time fever was supposed to be caused by cystitis, but a better acquaintance with urinary diseases has shown us that the cases in which it occurs usually have some renal or prostatic complication.

**Differentiation.**—It is often a question whether the disease is situated in the bladder or the kidney, in cases in which the bladder symptoms are not marked and where there is yet considerable pyuria and hematuria. In kidney cases, the frequency of urination is not marked, and pain is present in the lumbar region and not in the hypogastrium or perineum. The urine is usually acid when the kidney is involved and alkaline when the disease is in the bladder. Pus coming from the kidney is more intimately mixed with the urine, and settles more slowly than the pus of cystitis. The blood, in cases of hematuria due to renal disease, is also more intimately mixed, is sometimes of a dark, porterlike color and may be accompanied by ureteral clots. Examination of the genito-urinary apparatus shows obstructive conditions in the urethra or prostate in bladder cases, and cystoscopy reveals the presence or absence of bladder lesions. It will also show pus or blood coming from the ureters.

The only other condition closely resembling cystitis is posterior urethritis. In these cases, the symptoms are very similar as far as frequency of urination is concerned, and pain in the perineum. The history is different, however, as posterior urethritis usually follows anterior urethritis. The first urine may be cloudy and contain pus and shreds in posterior urethritis, and the second urine less cloudy or it may be clear; whereas, in cystitis, the first and second urines would be about the same. The pain in posterior urethritis is not in the suprapubic region. If hematuria is present, it follows the act of urination in posterior urethritis, and the urine that is first voided is not bloody, and contains no clots. If an instrument is passed, the prostatic urethra is found to be tender in posterior urethritis. On cystoscoping, no source of hemorrhage will be found in the bladder, but a certain amount of blood may be noticed trickling over the prostatic base from the posterior urethra if it is inflamed.

**Pericystitis.**—The tissue surrounding the bladder may undergo sclerotic changes as the result of a chronic pelvic cellulitis, or abscesses may form secondarily after a cystitis, prostatitis, parametritis, pyosalpinx, appendicular abscess and kindred conditions. Perivesical inflammation may also be the sequel of injuries or ulcerations of the bladder. The suppurative process occurs in the anterior vesical wall in Retzius's space, or beneath the serous covering of the bladder above the peritoneal reflection, or in the pelvic portion, or posteriorly in the part not covered by peritoneum.

The SYMPTOMS of pericystitis consist of general disturbances, such as pain in the lower abdominal region, digestive disturbances, fever and progressive loss of strength and frequently manifestations of pyemia. There is also local tenderness, vesical tenesmus and irritability. A swelling that corresponds to the position of the distended bladder may be made out by suprapubic or bimanual palpation. The symptoms of pyelitis are often present. The course depends on the virulence of the infection, and in mild cases resolution may occur without suppuration. Occasionally, a chronic pericystitis terminates in the formation of a fistula leading from the suppurating area into the bowel or into the bladder, and the discharge continues into these cavities and is passed out with the urine or at stool. In cases of sigmoiditis, there may be a fistula between the gut and the bladder. The presence of a vesical fistula may be tolerated for years without resulting in infection.

The DIAGNOSIS is based on the demonstration of an inflammatory thickening above the symphysis, corresponding in shape to the distended bladder, with tenderness on pressure and vesical irritability. The induration may be felt by bimanual palpation through the rectum. The persistence of a swelling in the bladder region after the bladder has been emptied is a sign of perivesical inflammation complicating a cystitis. Cystoscopic examination shows circumscribed or diffuse changes of the vesical mucosa (ecchymoses, edema, necrosis), especially in the case of perforating pericystitis. A fistula, if present, appears as a cup-shaped depression with granulating or cicatricial margins, and pus may be seen slowly exuding from the orifice. In performing suprapubic cystotomies in cases of cystitis usually due to obstruction, the pericystitis has been so marked, that, in trying to reflect back the peritoneum, the muscular wall has been torn off, and at times the mucosa as well, resulting in a rupture of the vesical wall.

The PROGNOSIS of pericystitis is favorable, provided the condition is promptly recognized and relieved by evacuation of the pus.

The TREATMENT is surgical and consists of free incision, suprapubic or perineal, followed by the establishment of free drainage. The causative disease back of the perivesical inflammation should be discovered and removed if possible.

**Treatment of Cystitis.**—The treatment of cystitis consists of internal, local and operative measures. Whenever the active symptoms are present, it is advisable to try internal remedies first, and, in case the patient is not benefited soon by this treatment, to resort to local measures. If the cystitis is, however, due directly to a pathological condition that can be removed or changed only by operation, then this should be resorted to, provided the patient is in a sufficiently good condition to bear it.

INTERNAL MEDICATION.—*Acute Cystitis.*—Internal medication consists of different classes of remedies: Palliative, specific, antiseptic, tonic, diuretic and laxative.

Acute cystitis requires the same treatment as the exacerbations of chronic cystitis. Palliatives, specifics and antiseptics are indicated. In the first place those palliative remedies that relieve pain, tenesmus and burning, among which are morphin, codein, belladonna, hyoscyamin, chloral hydrate, bromid of potash and demulcent drinks. Morphin, although the most reliable of all palliatives, should be given only when other remedies fail. Aspirin is now frequently used in its place, but is less potent. Codein does not relieve patients with bladder trouble as much as it does those suffering from a painful or spasmodic condition elsewhere.

Belladonna is one of the most reliable palliatives and antispasmodics. While it does not check the pain as promptly as an opiate, it is an excellent antispasmodic and relieves tenesmus. It is best given internally in connection with acetate of potash in acute cases or with benzoate of soda in chronic cases. The formula is "Belladonna and potash mixture."

℞ Tinct. belladonnæ ..... ℥ss;
Potass. acetatis ..... ʒj;
Aq. menth. piper. ad. ..... ℥iv.

Sig.: Teaspoonful three times daily in a glass of water between meals.

Hyoscyamin is given in a slightly larger dose than belladonna, 10 to 15 minims of the tincture, and can also be combined with the acetate or citrate of potash. These potash salts are likewise palliative when the urine is acid, as they tend to dilute it and thus make it less irritative.

Chloral hydrate is a very good palliative, but it is rarely given, except in cases of severe pain and tenesmus. The dose is from 7 to 15 grains, usually combined with some other remedy.

Bromid of potash is an excellent palliative, as it lessens pain and associated nervous irritability, thereby relieving the tenesmus. It is also generally given in a mixture with acetate or citrate of potash. In almost all cases of acute cystitis, which usually last for a week or two, it will be found that a mixture of belladonna and acetate of potash is sufficient to relieve the symptoms. In addition to this, however, it is advisable to give one of the urinary antiseptics and also hot sitz baths twice a day. In case the distress is very great at night, a suppository of morphin and extract of belladonna, each gr. ¼, is often more efficacious. A rectal injection of antipyrin gr. 15, laudanum ♏ 15, in water ℥ss also gives good results.

In the very acute attacks, that are rarely seen, such as the very painful and spasmodic condition that occurs in tuberculosis of the bladder and in ulceration near the vesical sphincter, only the most powerful palliatives afford relief. In such cases I am obliged at times to give the following remedy, which is the most efficacious as far as relieving pain is concerned. It consists of morphin ⅛ or ⅙ of a grain, chloral hydrate 7½ grains, bromid of potash 15 grains, peppermint

water up to 1 drachm. Codein ¼ of a grain can be used instead of morphin. One eighth of a grain of morphin should be used if patients are susceptible to the drug. In the hospital I call this mixture the "triple dose."

Tisanes are useful remedies, such as a hot infusion of flaxseed, 15.5 gm. to 500 c.c. This beverage may be freely partaken of and is rendered more palatable by flavoring it with a piece of licorice root or lemon juice and sugar.

Rest is also important, keeping the patient as much as possible in a reclining position. I do not mean by this that the patient should remain in bed; but that he should recline on a sofa, or in an easy chair, with his feet and legs elevated, and pass the time reading, or in any other way that is agreeable. In case the patient goes out, on returning he should again lounge about the house.

Of the urinary antiseptics for this condition, possibly salicylate and benzoate of soda 15 grains, uretropin 10 grains and salol 5 grains, are the best.

In the case of blennorrhagic cystitis, sandalwood oil is a better remedy than salicylic acid or salol. Boric acid is also considered a good remedy in acute cystitis and is given in combination with belladonna or hyoscyamin.

Hot compresses in the hypogastric region and perineum or leeches applied to the same locations are recommended, but I have found that but little relief has been obtained by their use.

Hot rectal douches, by means of the recto-genital tube, of salt solution made in the strength of a drachm to a pint, as hot as the hand can bear, are sometimes employed. In chronic cystitis, they are often of great value; but I rarely use them in acute cases, as I think the hot sitz baths are preferable. It is important to move the bowels daily, for which Apenta ℥iv or Carabaña ℥ij is recommended half an hour before breakfast.

*Chronic Cystitis.*—Up to this time, we have been speaking of acute cystitis principally, the treatment of which is symptomatic and palliative. The treatment of the acute exacerbations of chronic cases is similar to that of acute cystitis; but otherwise it differs in that the symptoms are less severe, while the disease is more progressive and depends on a definite cause. The principal object is the relief of the existing symptoms, the improvement of the health of the bladder and the control of the cause back of the disease.

One of the causes usually spoken of is acute cystitis, of which the chronic form is supposed to be a continuation. It is probable, however, that an acute inflammation does not become chronic unless there are certain predisposing causes that favor its establishment. These we may succeed in discovering and if unable to do so, we are obliged to say that it is a continuation of the acute process. If, however, we do discover the cause, but are not successful in improving the condition of the bladder by a brief treatment, it is advisable to remove the cause if possible. The patient's history and the urinary examination will show if there is a chronic cystitis present, but it is of the utmost importance

to make the regular routine examination of the urethra, prostate and bladder, as described in the first section of the book, in order to discover its cause.

The palliatives used in chronic cystitis are practically the same as in acute cystitis; but it is rarely necessary to resort to those that have a powerful action, excepting when there is an acute exacerbation of the trouble. Belladonna and hyoscyamin are generally sufficient to relieve the irritability, and morphin can be added to belladonna during the acute exacerbations. Chloral hydrate and bromid of potash are never used. Flaxseed tea is a useful demulcent drink in all cases of bladder trouble.

The balsams, specifics and antiseptics are the principal remedies that are used steadily. Sandalwood oil, copaiba and cubebs represent the balsams, the two latter being rarely prescribed in these cases, whereas sandalwood oil is very widely employed, both alone or in combination. It frequently gives great relief to the patient, and often does more to diminish the amount of pus present than any other remedy. The usual dose of sandalwood oil is 15 drops three times a day. It can be given in capsules of 5 to 10 drops, and in sufficient numbers to make 45 drops daily, although 30 drops daily are sufficient in chronic cases.

Copaiba is usually given in from 10- to 15-drop doses, but it is rarely used in bladder cases, and cubebs still less frequently. Other remedies of this type are buchu, uva ursi and corn silk, which often afford considerable relief to the patient. Buchu is especially useful when given in combination with a vegetable salt of potassium, when the urine is highly acid and a constant desire to urinate is present. The dose of the fluid extract of buchu is from ½ to 1 drachm (4 c.c.). Uva ursi, which has a slightly stimulant and diuretic action, may be given in doses of 1 to 2 drachms of the fluid extract (8 to 15 c.c.). It produces a discoloration of the urine, from pale green to dark greenish brown, due to chemical changes. Corn silk is often very serviceable in chronic cystitis, as a diuretic and sedative for the urinary passages. Internally, it is best administered in the form of an infusion in boiling water (1:8), the dose of which is indefinite.

Antiseptics are very useful in the treatment of chronic cystitis, as they prevent the urine in the bladder from decomposing, and thereby prevent the formation of ammoniacal urine, which increases the irritation of the bladder wall and the quantity of pus. They also render antiseptic the urine coming from the kidney, thus protecting the renal pelvis from infection.

The best urinary antiseptic is, probably, urotropin, given in from 7 to 10 grains to each dose, three times a day, which is usually sufficient; a larger amount often gives rise to irritation of the mucosa of the urinary tract, particularly of the kidney, which is the most sensitive. The amount of urotropin that can be taken by a patient who has but a small amount of healthy renal tissue is often surprising. One of my patients who had but one kidney, the other having been removed, in which existing kidney there was a large stone

and pyelo-nephritis present, and who had, moreover, a cystitis and a hypertrophied prostate, thrived on 30 grains of this drug daily, and his symptoms became worse whenever it was omitted. No other urinary antiseptic alone or combined with palliatives gave him as much relief, and he immediately began to run down when he changed treatment.

Under the group of benzoates, we have very efficient urinary antiseptics. Benzoate of soda is an extremely valuable remedy, and one of the most efficacious that is used in chronic cystitis. I use it, perhaps, more than any other remedy in this condition, and give it in from 15- to 20-grain doses, three times a day. In patients with considerable tenesmus, I prescribe it in a mixture with the tincture of belladonna, the formula being:

B. AND B. MIXTURE

℞ Tr. belladonna ..... ℥ss;
Benzoate of soda ..... ℥j;
Aqua gaultheria .....q. s. ad. ℥iv.

Sig.: ℥j three times a day in a glass of water between meals.

This is a standard mixture used in chronic cystitis. Benzoic acid is also a valuable remedy in the treatment of cystitis with alkaline urine, especially when there is a fetid odor present. It is given in 15-grain doses, in capsules.

Of the salicylates, salicylate of soda in 15-grain doses, three or four times a day, is also a good urinary antiseptic, but it is not well borne by the stomach. Salol is better tolerated, and is not only valuable as a urinary antiseptic, but also as an intestinal antiseptic in cases in which there is fermentation and putrefaction going on in the bowel, giving rise to indican and other renal irritants. It should not be kept up too long, on account of the amount of carbolic acid that it contains. I give this drug in 5-grain tablets, three or four times a day.

Eucalyptol is a powerful urinary antiseptic, but not very popular. It is given in doses of 5 drops in capsule, every four to six hours. Oil of wintergreen is also valuable as a urinary antiseptic, and can also be given 5 drops to the dose, three or four times a day, in capsules.

Cystogen is a very popular remedy, and a useful alterative diuretic. The dose is 15 to 20 grains (1 gm.) three to four times daily, well diluted. Cystogen is chemically hexamethylenamin tetramin, that is, a condensation product of ammonia and formaldehyd, practically the same as urotropin (Wood).

In giving urinary antiseptics for some time, it is well to alternate them so that the system will not become too much accustomed to the remedy and thereby have an irritation produced or the efficacy of the drug lessened. The best standard antiseptics to use in this way are urotropin, benzoate of soda and salol, changing from one to the other every week or two.

Tonics are valuable remedies in cases of cystitis in which the bladder wall is atonic, or when the patient is weak on account of chronic sepsis or from loss of blood owing to hemorrhages. The best bladder tonic is strychnin. It should not be given in large doses; I use $\frac{1}{60}$ grain, three times a day.

Iron is the next best tonic. My favorite mixture is Basham's mixture, in doses of from 2 to 4 drachms, three times a day. In cases of hemorrhage from the bladder, I give from 15 to 30 minims of the tincture of the chlorid of iron, three times a day, and also the same dose of the fluid extract of ergot. This has given me the best of results in cases of cystitis associated with bladder hemorrhages.

The general health should be kept up, in chronic inflammation of the bladder, by a moderate amount of exercise and plenty of fresh air and sunshine, as well as bathing. Turkish baths are valuable, as they keep the skin active; so, also, are sponge baths with water the temperature of the room, followed by a brisk rub.

Diuretics are not indicated, although mineral waters with diuretic properties are valuable in counteracting certain conditions. In the uric-acid diathesis, the waters of Contrexéville and Wildungen are of especial value. The water that I recommend principally for general use in all bladder and kidney conditions is Célestine Vichy, in a moderate quantity. It seems to give the best results and to be better tolerated than other waters.

Laxatives should be given in cases in which the bowels are sluggish, as is frequently the case. Apenta and Carabaña waters are the favorite aperients. Constipation favors the accumulation of colon bacilli in the bladder, thus aggravating the disease. Sodium phosphate is a useful remedy in these cases, and helps, moreover, to acidify the urine. It may be given in doses of from 20 grains to 2 drachms, one, two or three times daily, according to the laxative effect desired; although it is not desirable to give more than ʒj of the salt a day.

In cystitis accompanied by oxaluria, the crystals irritate the mucosa of the bladder, and it is necessary to treat this trouble by appropriate diet and medicines. (See chapter on Metabolism.)

Local Treatment.—The local treatment of bladder trouble consists of introducing certain solutions into the viscus to be passed out again at once, or to remain and mix with the urine, to be voided with the next act of micturition. The former are called bladder washouts, douches or irrigations, and a considerable amount of solution is used; whereas the latter are called bladder instillations or injections, and but a small quantity is employed.

Bladder irrigations are given in different ways: Through the urethra by hydrostatic pressure from a fountain syringe (Janet) (Fig. 437 A); or through the catheter, propelled by gravity, from a fountain syringe (Fig. 437 B), or else by means of a piston hand syringe (Fig. 437 C). The quantity of solution

used is generally as much as the bladder can tolerate. It may be washed out once or several times.

The irrigations by the Janet method are given through the urethra, overcoming the sphincter muscles and allowing the fluid to enter the bladder; it is then passed out again. This method is valuable where a urethritis exists in connection with a cystitis, or in cases in which a stricture is being dilated and it is desirable to irrigate the urethra as well as the bladder.

Fig. 437 A.—A Cut-off with Its Shield and Blunt Tip for Urethral Bladder Irrigations from a Fountain Syringe.

Fig. 437 B.—Cut-off and Pointed Tip Used for Bladder Irrigations through Catheter.

Fig. 437 C.—Large Six-ounce Piston Syringe for Bladder Work.

For all other cases, it is better to irrigate by means of a catheter, unless we find that the passing of the catheter causes traumatism, as is shown by the occurrence of urinary fever afterwards, in which case the irrigations should be given by the Janet method, as it is not followed by fever. Prostatitis, however, is more apt to occur, if not already present.

In using a catheter, one of small caliber is preferable. It should be of soft rubber, from 12 to 14 French. The bladder is then washed out by means of either a piston or a fountain syringe. It is claimed that a piston syringe is better, in that spurts of fluid can be sent into the bladder, which washes out the mucus and pus from the bladder wall more efficaciously. This may be so, but, at the same time, vigorous jets often tend to irritate the bladder.

Irrigation by means of the fountain syringe with a cut-off valve and a small tapering tip fitting into the catheter is probably the best method of washing out the bladder. The flow is more gentle, and the pressure can be regulated to suit the patient both by means of the cut-off valve and the elevation of the reservoir. This is the method of bladder irrigation employed in cystitis at the office. The solutions used are boric acid, bichlorid of mercury, formalin, oxycyanid of mercury, permanganate of potash, protargol and nitrate of silver.

Boric acid is most frequently used for washing out the bladder. The soli-

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tion employed is of four-per-cent strength. The bladder is washed out generally through a catheter. It is a mild, cleansing antiseptic solution, and that is about all to be said in its favor.

Bichlorid of mercury, in 1:4,000 to 1:40,000 solution can be used for a vesical irrigation through a catheter, but is not well tolerated by the bladder.

Formalin, in a 1:5,000 to 1:4,000 solution, has been most satisfactorily used for cleansing the bladder and diminishing the amount of pus, especially in our clinic work.

Oxycyanid-of-mercury solution, in a strength of from 1:5,000 to 1:2,000, is considerably used, and good results from its employment have been reported; but personally I have never given it a trial.

Permanganate-of-potash solution, in a strength of from 1:4,000 to 1:1,000, has been considerably used in my office, especially in cases in which cystitis is associated with a urethritis, when it is given by the Janet method.

My favorite remedy is the nitrate of silver. I use silver-nitrate solution of from 1:8,000 to 1:1,000, and generally my most satisfactory cures have been obtained by the use of this solution. I use it often by the Janet method when a chronic urethritis is also present, as well as after passing sounds in stricture cases; but in most cases of cystitis I inject the solution through a catheter. The bladder irrigations are given two or three times weekly, beginning with a weak solution and gradually increasing the strength, the quantity most easily tolerated by the bladder being used. Irrigations with silver nitrate do not kill the germs, as these are within the tissue; but they clean the bladder and destroy the germs on the surface, inhibiting further growth and fermentation of urine.

Alum is sometimes used as an astringent bladder wash, especially in cases of cystitis attended by hemorrhage. It can be employed in any strength that is tolerated by the bladder, from a saturated solution downward.

Bladder instillations or injections are applied by introducing small amounts of stronger solutions into the bladder by an instillating syringe, or, through a catheter passed into the viscus, by an ordinary small hand syringe (Fig. 438). They practically correspond to topical applications of the vesical neck and the prostatic urethra, and are accordingly indicated when the inflammatory process is especially severe in this location. The remedies used are very numerous. The quantity applied in this way is usually from ½ drachm to 1 ounce, usually ʒj to ʒiv. A picric-acid solution is considerably used in Latin countries, although it is very little employed by us. I have used it considerably, but without satisfactory results.

Bichlorid of mercury is employed by some as an instillation of the trigone, in cases of tuberculous cystitis, and favorable results have been reported from its use. I have always found it too irritating, and cannot recommend it, except

as a bladder irrigation after a perineal section has been performed, in case of a cystitis due to stricture or prostatic hypertrophy.

Good results have been obtained by injecting the fluid extract of corn silk, diluted with water, after the bladder has been washed out, especially in cystitis dependent upon a stricture.

Gomenol oil is indicated in cases in which considerable bladder irritability is present. It is used in solutions of strength of ten to fifty per cent, and is especially recommended in tuberculous cystitis. I have used gomenol oil in twenty-per-cent strength in many cases of cystitis, especially in tuberculous cases, with the most satisfactory results. I generally inject half an ounce of the solution into the bladder and allow it to remain after I have washed out the bladder with strong silver solutions.

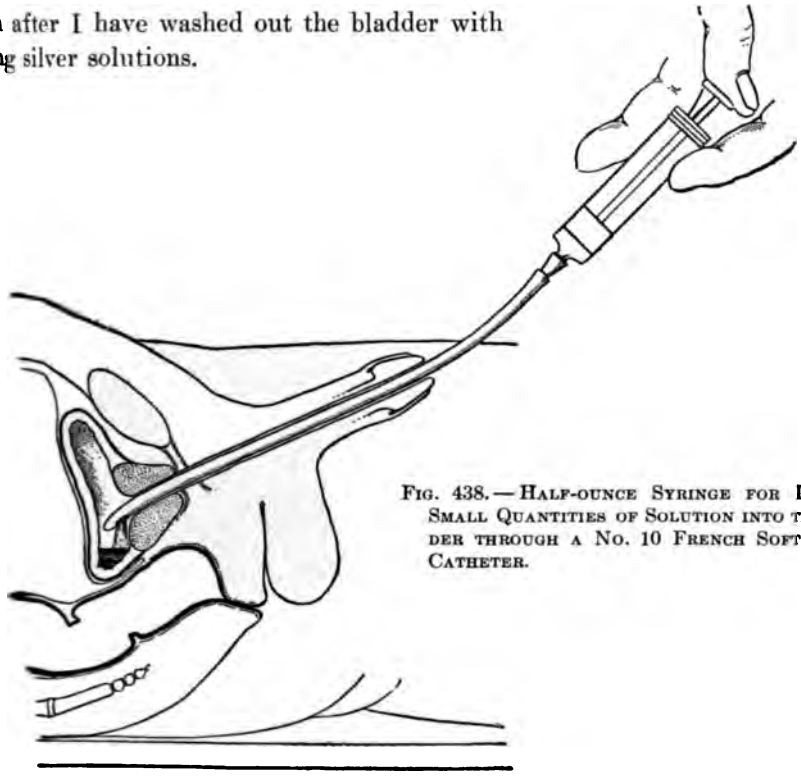

FIG. 438. — HALF-OUNCE SYRINGE FOR INJECTING SMALL QUANTITIES OF SOLUTION INTO THE BLADDER THROUGH A NO. 10 FRENCH SOFT RUBBER CATHETER.

Iodoform emulsion is also much used in tuberculous cystitis in ten-per-cent strength. In giving gomenol or iodoform emulsion, from a drachm to an ounce should be injected through a catheter and allowed to remain until the patient again empties the bladder.

Argyrol in five- to twenty-per-cent strength, beginning with a weak solution, is frequently used for small injections of ʒj to ℥ss, with a favorable effect, after washing out the bladder with silver solution.

Protargol is stronger, and is used from one to five per cent in the same way.

It is said that irrigations cleanse the bladder, and instillations cure it. I think that the best way to cure a chronic cystitis is to wash the bladder out with a boric-acid solution until it is clean, then once with nitrate-of-silver solution and then to inject ℥ss of a strong solution of argyrol or gomenol to be retained. The strength of the silver irrigations and the injection to follow should be carefully studied, as well as the desired frequency of the treatment and the toleration of the patient to instrumentation, as they vary in different patients.

Chronic cystitis and atony of the bladder may remain after operations on the prostate or a strictured urethra. The two conditions are often associated, and the atony is apt to persist after the inflammation has been cured, in spite of the astringent and stimulating solutions that are used in the bladder. In these cases of atony recourse may be had to electricity through the medium of water. All parts of the bladder are accessible to this treatment, and the current is applied to the vesical wall at different stages of distention. A salt solution is the best medium, the water charged with electricity being brought in contact with the bladder by means of an electrode. The instrument used is a double-current, sound-shaped douche tube made of hard rubber. The inflow part is connected with a douche jar containing salt solution and the outflow with a douche pan beneath the patient. The tube is connected with one pole of a faradic battery and the electricity is communicated to the solution in the inflow part of the tube, thus charging the fluid entering the bladder. The other pole of the battery is connected with a flat sponge that is placed over the lumbar region of the cord. The tube and the apparatus are shown in the accompanying illustration (Fig. 439).

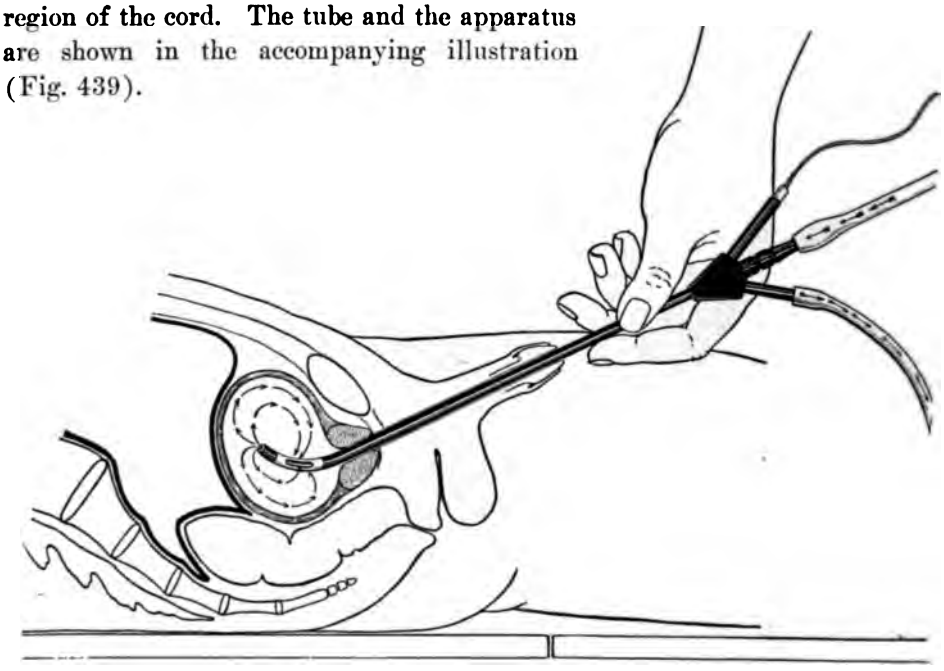

Fig. 439.—Bladder Electrode Giving Electric Bladder Douches in an Atonic Bladder.

THE TREATMENT OF THE CAUSE.—The object of radical measures is to give free drainage to the urine, and, if any obstruction exists, to remove it. Obstruction is one of the principal reasons for cystitis; therefore, such a condition should be discovered and overcome. All strictures that can be dilated should be treated with sounds or dilators, followed each time by irrigation of the urethra and bladder with one of the antiseptic solutions just enumerated. If the strictures are too resilient or too resistant to be cured by dilation, they should be cut by external or internal urethrotomy, depending upon their location. Every urethra should be cut or dilated to such a degree that it will take a sound of from 28 to 32 French. In other words, the narrowings should be enlarged until they are equal to the normal portion of the canal. Congenital strictures, such as are seen at the meatus or fossa navicularis, should be cut. I have had many cases brought to me in which these congenital narrowings were the predisposing cause of a cystitis, and yet they had not been cut. The simple division of these congenital bands marked the beginning of the cure of the disease. Certain cases of frequent urination observed in patients with aseptic bladders who had never had a urethritis, and who were passing clear urine, led me to cystoscope such patients after cutting the meatus, and I was able to see the evidence of bladder strain in the trabeculation of the viscus.

In the case of an enlarged hypertrophied prostate bulging into the urethra and bladder to a sufficient degree to cause bladder strain, another obstruction is met, which calls for either a prostatectomy or a prostatotomy, or constant treatment of the bladder. A prostatic hypertrophy of sufficient size to cause retention of two or more ounces of urine, and an obstinate cystitis, requires enucleation if the residual urine increases and the cystitis is not relieved by treatment.

When there is a definite cause in the bladder, such as a vesical calculus or a tumor, there should be no waste of time in treating the bladder, the stone should be removed by crushing or by other operations; whereas, in case of a new growth, it should be removed by suprapubic cystotomy and excision. After the removal of the cause, the treatment of the cystitis can be carried on with good results.

In the case of vesical tuberculosis, an operation is not indicated unless an obstruction, due to narrowing of the urethra, is present, in which case the stricture should be cut. Nephrectomy also predisposes to the cure of a tuberculous bladder, if there is a tuberculous kidney present on but one side.

In women, cystocele, malpositions of the uterus, the presence of pelvic tumors, cysts, exudates, bowel displacements through the influence on the bladder wall by pressure, or traction, interfere with the bladder function at times to a marked degree, causing bladder strain and congestion. These primary external conditions or the influence of the adhesions and displacements after-

wards should be treated by operation—as uterine fixation; shortening of the round ligaments; curettage; repair of the cervix or perineum; the opening and draining of pelvic abscesses; the removal of ovarian and hydatid cysts and fibroid and malignant uteri; the separation of adhesions resulting from such conditions and the repair of cystocele constitutes the radical treatment of this interesting group of diseases. (See chapter on Urinary Disturbances Due to Extravesical Causes.)

# CHAPTER XXXIX

## ULCER OF THE BLADDER

In their typical form, ulcers of the bladder represent a strictly localized lesion in an otherwise perfectly healthy vesical mucosa. There may be two or three ulcers, but as a rule the ulcer is solitary. Its usual site is at the posterior vesical wall, in the region of the trigonum, where its presence may be revealed by means of the cystoscope. A simple vesical ulcer frequently remains for years strictly localized and latent without becoming associated with a diffuse cystitis.

**Etiology.**—Vesical ulcers must be regarded in a way as analogous to ulcers of the stomach, inasmuch as external intoxications or toxic infections may become the cause of gastric ulceration, and the same etiological factors may enter into consideration for the development of ulcer of the bladder, and it is not always possible to decide why the stomach or the bladder, respectively, should be attacked in a given case. Trophic ulceration of the bladder has been observed in certain diseases of the nervous system.

**Pathological Anatomy.**—The common feature of the various types of vesical ulceration is the predominance of the ulcer as such, while cystitis is very nearly or altogether absent. The ulcer presents a punched-out, craterlike appearance, with a grayish base and thickened, indurated margins. Its base is often markedly granular with a thick, yellowish-white deposit.

The appearance of the vesical mucosa in the vicinity of the ulcer may be entirely normal, or the color may be darker and the surface studded with round or flattened protuberances. This granular condition is often distributed in limited areas, gradually becoming more diffuse.

**Symptoms and Course.**—Hematuria is often for a long time the only symptom of an insidious ulcer of the bladder. A diffuse interstitial cystitis may result from such an ulcer, in which case its clinical picture may predominate to such a degree that the etiological part played by the ulcer in the production of the cystitis may be overlooked. The usual outcome of ulceration of the bladder is a persistent cystitis, of abrupt onset, with very severe pain, followed by intermittent hematuria. The pain may be located at any point of the bladder or the urethra, and is either constant or may be induced by the act of micturition. Frequency of urination is not invariably present, however, except during the attacks of hematuria. The urine is generally clear, some-

times slightly clouded, containing a small amount of pus. When hematuria is very profuse and is associated with vesical congestion, the urine may contain clots, the expulsion of which causes more or less pain. Repeated and profuse attacks of painless hematuria are suggestive of simple solitary ulcer of the bladder rather than a generalized cystitis.

**Complications.**—In neglected or improperly treated cases, the local inflammation of the bladder becomes diffuse and interstitial. In still more unfavorable cases, a simple vesical ulcer may be transformed into tuberculous or neoplastic ulceration.

**Diagnosis.**—A simple ulcer of the bladder, not associated with cystitis, may be recognized without difficulty in a cystoscopic examination, which should be resorted to in all cases. Aside from cystoscopy, a careful consideration of the symptoms will suggest the possibility of an ulcer, which must at once be suspected when hematuria bears no relation to pain.

**Prognosis.**—In the absence of cystitis, simple ulcer of the bladder has a favorable prognosis, provided the condition is recognized in time and properly managed. The depth of the ulceration affects the prognosis less seriously than the extent of the surface area involved, and the tendency of the ulcer to spread.

**Treatment.**—Palliative measures are of value only to relieve symptoms. Operative measures are necessary. The ulcers can be operated by means of an operating cystoscope, curetting the ulcers and cauterizing them. Cauterization is best performed by means of an air cystoscope, and it is very unsatisfactory in a fluid medium. I believe, however, that the surest method of cure is to do a suprapubic cystotomy, curette the ulcer and cauterize its base with the Paquelin cautery. After this, the bladder should be drained for at least two weeks, thus keeping the organ at rest for a sufficiently long time to allow a curative process to begin.

**Illustrative Cases.**—In one case, the patient was a traveling salesman, tall and thin, thirty-seven years of age. About five years before, he hurt his back by lifting a heavy box, and had never fully recovered from the resulting lameness. Some time after this, he noticed that his urine was dark red in color and remained so for a long time. He was informed that he had Bright's disease, and had only a short time to live. The urine gradually became normal, but his back remained lame, so that he could not bend over without resting on his hands and knees. He gained in weight, however, and stopped all treatment. One year ago, he began to suffer severe pain after eating, which was relieved by a milk and egg diet. Examination of the bladder by rectum was negative. There was no tenderness in the region of the kidneys. The meatus was very small. The urine was turbid, due to pus. It showed only bladder elements together with pus, and blood cells, bladder epithelia, nuclear albumin and mucus. After a meatotomy, the patient was cystoscoped and a large vesical ulcer was discovered, about three quarters of an inch in diameter, having a

red base with granulations and covered with a thick membranous deposit. It was situated above the trigone in the median line. Suprapubic cystotomy was performed and two ulcers were found, one three quarters of an inch in diameter and another below it two fifths of an inch in diameter (Fig. 440). The ulcers were curetted and cauterized with the Paquelin. The patient made a good recovery. The main ulcer of the bladder was much deeper than it had appeared on cystoscopy and its edges were very much thickened.

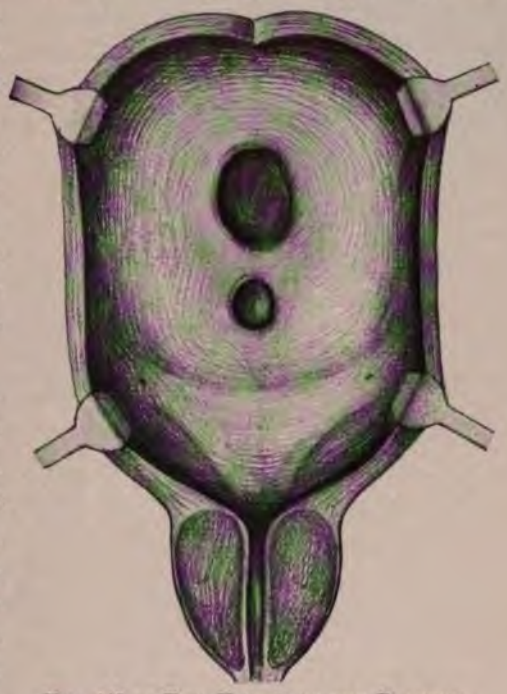

FIG. 440.— TWO ULCERS OF THE BLADDER. (Author's case.)

Another case, a man aged fifty-three, with a large single ulcer of the bladder, came under my observation. He was sent to me at the Columbus Hospital for examination. He had, besides the ulcer, a cystitis and pericystitis. I cystoscoped him and saw the ulcer in the anterior and upper wall of the bladder. I advised operation, but the patient declined and left the hospital. Some months afterwards, he was sent to the hospital in a critical condition and died a few hours later. Autopsy revealed an intraperitoneal perforation of the ulcer.

# CHAPTER XL

## TUMORS OF THE BLADDER

**Occurrence.**—The occurrence of new growths in the bladder has been known for a long time, but it was not until the last quarter of the nineteenth century that our knowledge of this subject was made accurate through the studies of their pathology by Rokitansky and Virchow, and the improved methods of examination by means of the Nitze cystoscope.

Vesical tumors may be assumed to occur with a relative frequency of about five per cent of the neoplasms in general. The majority of these cases are seen in male patients. While the bladder may become the seat of a tumor at any age, the greatest number are observed between the ages of forty and sixty. Tumors of the connective-tissue group, myxomata and sarcomata, predominate in childhood, whereas epithelial neoplasms are usually seen at an advanced age. Carcinoma of the bladder occurs between the ages of fifty and sixty. Sarcomas are the most frequent in childhood and adolescence, and are not so common after fifty. Myxomatous tumors are frequently found in children.

**Etiology.**—The etiological factors giving rise to tumor formation in the bladder are not well known. Long-continued irritation of the vesical mucosa is believed to result in a proliferation with villous formations, resembling tumor tissue. Traumatism has also been known to start the formation of these growths, but exact data pointing to the cause are generally wanting. Vesical tumors may occur after lesions due to a stone in the bladder or after the traumatism of instrumentation. I can trace the cause to traumatism in but one of my cases, and in this case it grew from an incision made through the base of the prostate some years ago, after a Bottini operation (Fig. 441 A).

FIG. 441 A.—PEDUNCULATED TUMOR GROWING FROM THE INTERNAL MEATUS AND THE PROSTATIC URETHRA IN THE LINEAR SCAR RESULTING FROM A BOTTINI OPERATION. *T*, the tumor flagellæ; *P*, its pedicle. (Author's case.)

It is said that a chronic cystitis may terminate in epithelioma of the bladder. It is probable, however, that in these cases the tumor already existed

before the cystitis, without its presence having been recognized. Bilharzia infection has been referred to by French writers as the cause of vesical tumor, but this parasite is rarely seen in this country. Heredity is a conceded etiological factor in neoplasm in general, and I know that it has much to do with the presence of a malignant growth in the bladder. At the present time, I have under observation two cases of tumor of the bladder in which carcinoma existed in the fathers of the patients.

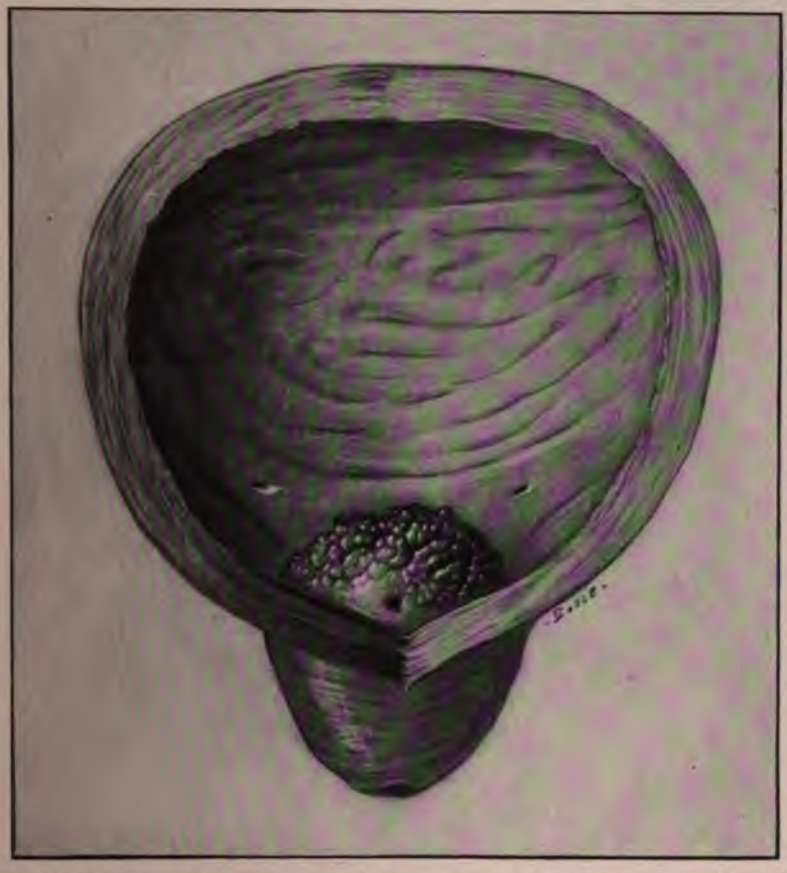

FIG. 441 B.—TUMOR GROWING INTO THE BLADDER FROM THE PROSTATE AND REMOVED WITH THE PROSTATE BY PROSTATECTOMY. (Author's case.)

**Histology and Pathology.**—The classification of these tumors is generally governed by their histological structure, and the following division is here presented:

(1) Epithelial and fibro-epithelial tumors, including the papillomas, adenomas and carcinomas. Papilloma occurs in twenty per cent of all tumors.

(2) Tumors of connective-tissue growth, such as sarcomas, fibromas and myxomas.

(3) Tumors of muscular tissue, represented by the myomas and rhabdomyomas. These growths are rare, especially the latter variety.

(4) Heterogeneous forms, which include tumors made up of tissues that do not belong to the normal structures of the bladder, such as dermoid cysts, hydatid cysts and chondromas.

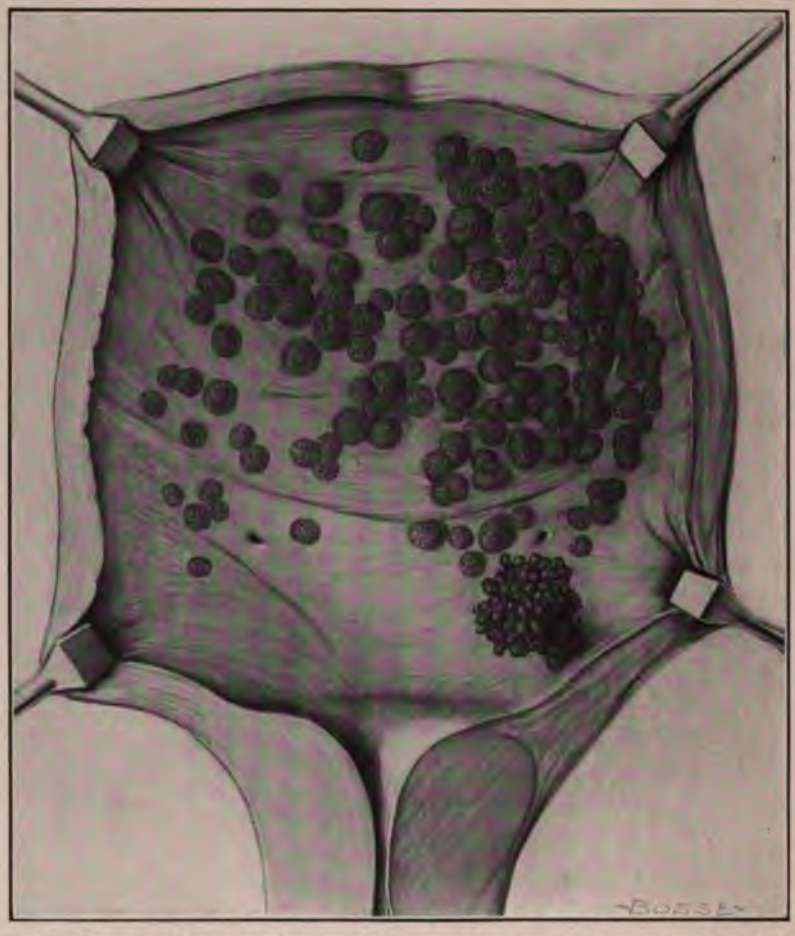


FIG. 442.—CASE OF MULTIPLE VILLOUS CARCINOMA OF THE BLADDER WITH ONE FAIRLY LARGE SESSILE TUMOR. (Author's case.)

The relative frequency of these tumors is as follows: The tumors of epithelial origin constitute the vast majority of these bladder growths, and are much more common in men than in women. The tumors of the connective-tissue group are rarer and occur generally in children, more frequently in girls than in boys. Muscular-tissue tumors or myomas are very rare.

The character of vesical tumors is benign or malignant. In the latter variety, there is an involvement of all the layers of the bladder wall as well as the

formation of metastases. The transition of a benign tumor into the malignant form is of frequent occurrence in the bladder.

Vesical tumors may be primary or secondary. Primary tumors develop originally in the bladder wall; secondary tumors grow into the bladder by ex-

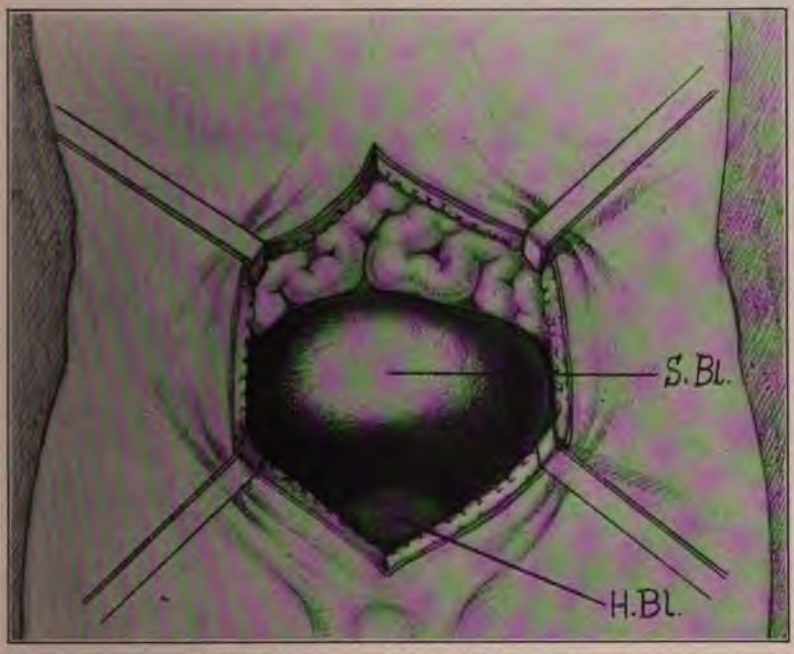


FIG. 443.—EXTENSIVE INOPERABLE VESICAL SARCOMA.
*S. Bl.*, sarcomatous part of bladder wall; *H. Bl.*, healthy part. (Author's case.)

tension from the prostate (Fig. 441 B), uterus, rectum or vagina. Besides this, there are metastatic tumors which occur in the bladder, secondary to tumors located in distant tissues. The seat of predilection of all vesical tumors is in the inferior hemisphere of the bladder, just above and below the line of the ureteral orifices, in the paratrigonal fossa and about the base of the prostate.

Vesical tumors in about thirty-three per cent of all cases are multiple. Their number may be considerable, and the individual growths are then usually of small size. Very often a tumor of considerable size is associated with a number of smaller growths which have been spoken of as the seeds of the tumor (Fig. 442). The size of single tumors varies from that of a small pea to that of a small watermelon, and occasionally a large part of the bladder wall is a tumor (Fig. 443; see also Fig. 451).

The consistence of these tumors is usually soft and spongy in character (which led to the former name of fungus), whereas a number of others are hard as wood and resistant to the touch. The shape and general configuration of these tumors are independent of their histological structure. Frequently the

base of the growth presents at its top an irregular proliferating aspect, resembling somewhat the surface of a cauliflower (Fig. 444). In other cases,

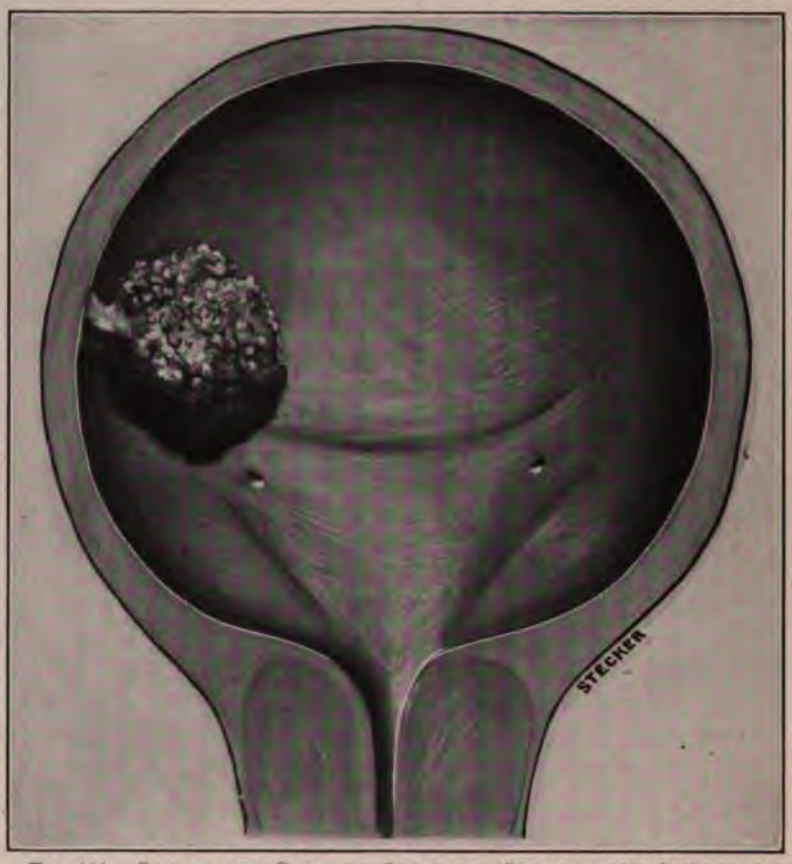


FIG. 444.—CAULIFLOWER GROWTH. SARCOMA OF BLADDER. (Author's case.)

FIG. 445.—VILLOUS TUMOR. Delicate slender filaments as seen by cystoscope and taken by cystophotography. (Pousson.)

the tumor has growing from its end fine polypoid villi or delicate slender filaments floating in the fluid, resembling the tendrils of an aquatic plant (Fig. 445; see also Fig. 441 A).

Sessile tumors have a base which may vary in thickness (Fig. 444), whereas pedunculated tumors are attached by a very slender pedicle (Fig. 446). The infiltrating tumors occupy a more or less extensive area of the bladder wall, resulting in loss of elasticity and the transformation of the bladder into a rigid pouch. Some project into the vesical cavity, while others do not protrude

at all, forming areas of infiltration that extend deeply and widely into the bladder wall (Fig. 447). Vesical neoplasms may invade, by continuity, the prostate, urethra, ureters, seminal vesicles, peritoneum, bowel or rectum in the male and the vagina in the female. It may be difficult to decide, in many

Fig. 446.—Pedunculated Tumors Attached by a Slender Pedicle. (Albarran.)

instances, whether the vesical growth is primary or secondary. In the case shown in Fig. 443, the mass was so extensive that I could not tell before the operation whether it had originated in the bladder wall or not, although after a most careful examination I believed it to have started in the bladder wall. In a few instances, the bones of the pelvis and the pelvic cellular tissue have been attacked. In a number of cases, there has been an involvement of the lymphatic ganglia situated along the hypogastric arteries and the common iliac. One of my patients had a marked enlargement of the thigh and leg on that side.

Certain secondary changes are caused in the urinary passages by the presence of a tumor, such as inflammation of the bladder, ureter and kidneys; hypertrophy of the vesical walls; renal retention of urine through involvement of the ureteral opening by the growth; dilatation of the ureters and pelvis of

FIG. 447.—MALIGNANT INFILTRATING TUMOR OF THE BLADDER. (Albarran.)

the kidney (Fig. 448); hydronephrosis, pyelitis, pyelonephritis, pyonephrosis or atrophy of the kidney.

**Symptoms.**—The symptoms of a vesical growth in the bladder are changes in the urine, disturbances of urination, pain, local symptoms due to urinary infection and disturbance of the general health.

A vesical tumor may exist for years without giving rise to symptoms. In the majority of cases, the initial symptom is *hematuria*. The bleeding of vesical tumors is characterized by its abundance and its spontaneous appearance and disappearance, and its independence of exercise or rest. In

the early stages, it is often the only symptom, and an attack may be followed by a period of comfort and lack of symptoms for weeks, months or years.

One of my patients, sixty-five years of age, who has an infiltrating tumor of the bladder that can be outlined by recto-abdominal palpation, has gone for ten years since his first hemorrhage without other disturbances than an occasional slight hematuria. Another patient, with a sessile tumor, had suffered from occasional hemorrhages for eight or nine years, and five years ago had an attack of such severity that he was almost exsanguinated and expected to die. Since this very grave attack was relieved by the use of adrenalin, the patient has been able to go for weeks or months with but an occasional pinkish tinge of the urine. In the case of another patient, fifty-five years of age, who died from an intercurrent pulmonary trouble, the vesical tumor had existed for years. It could be palpated bimanually, but there had been no trouble except occasional very slight hemorrhage.

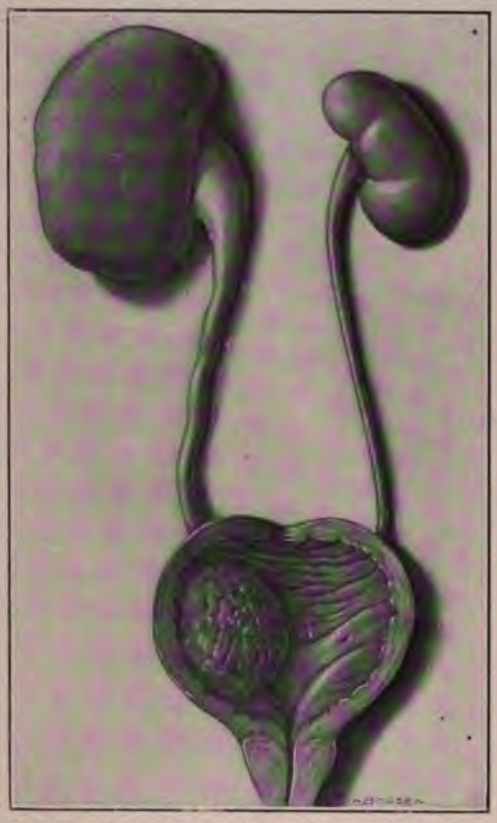

Fig. 448.—Sarcoma over Right Ureter with a Pyonephrotic Kidney Above It. (Author's case.)

Another interesting case was that of a patient fifty years of age, who came to the hospital with a history of passing urine with difficulty, tenesmus and hematuria. The house surgeon who examined him could not pass the smallest instrument through the urethra. He made the diagnosis of impassable stricture and placed the patient on the list as an emergency operation. Under ether, a No. 30 sound was easily passed, and when one of the doctors present at the operation started to leave

Fig. 449.—Tumor Giving Rise to Spasmodic Stricture. *B*, Bladder tumor. (Author's case.)

the room, joking about the impassable stricture, I called him back, saying that spasmodic stricture was always due to some cause, and that if he would wait I would try to find it. Proceeding to a bimanual palpation of the bladder, I felt the growth and performed suprapubic cystotomy, removing a tumor of the vesical wall three inches in length and two in width (Fig. 449).

Some of my patients, who have had a tumor of the bladder for a number of years, are traveling about, going to different parts of this country and Europe. They always carry with them certain remedies to use in case of an attack of hematuria, as well as a list giving the names of physicians in the countries in which they are traveling, whom they may consult in case they are not able to stop the hemorrhages. The attacks of hematuria are often very painful when clots form in the bladder or obstruct the urethra, giving rise to retention. As the disease advances, the attacks of hematuria are apt to occur with increasing frequency and severity, especially if the tumor is malignant. The loss of blood is, however, rarely as much as the patient estimates, on account of being mixed with the urine. The hematuria usually consists of a red or red-yellow fluid in aseptic cases, although in certain cases large clots are present. In septic cases of long standing, the urine is light brown or yellowish brown in color, thick and sirupy from the admixture of pus and blood. Hemorrhages are frequently started by the passage of instruments in the examination or treatment of the patient.

*Disturbances of micturition* vary in accordance with the position and size of the growth. When a tumor is small or situated in such a position as not to interfere with the urinary flow, there may be no disturbance, even when malignant. In the case of a pedunculated growth, however, a part of it is liable to be swept by the urine into the vesical orifice, causing sudden and repeated interruptions of the stream. The flow of urine may also be interrupted by a soft tumor situated above the urinary orifice.

Micturition is also interfered with by infiltrating tumors or by dense growths filling up the bladder cavity; in the first instance, because the bladder wall is rigid and unyielding, and in the second, because there is a mechanical obstruction to normal bladder contractions. These disturbances of micturition are most marked when the tumor is situated on or near the sphincter muscle of the bladder. Retention of urine is sometimes caused temporarily by the urethra becoming plugged with pieces of membrane composed of pus, epithelia, mucus and fibrin that have been spread over the surface of the tumor in cases in which cystitis is present. In one of my cases, a piece five inches long and half an inch thick in its largest diameter, resembling a large vermiform appendix, stuck in the urethra and had to be gently withdrawn (Fig. 436). Such plugs had frequently obstructed the urethra in this patient, giving rise to pain and urinary retention.

*Pain* may be absent in either papillary or malignant growths, especially

if the bladder is healthy. Once infection has taken place, however, pain is a more or less constant symptom. This pain is present over the pubes between the acts of micturition and in the glans penis and neck of the bladder during micturition. When the bladder is full of clotted or fluid blood, or when a membranous plug or clot is blocking the urethra, the pain is often very severe. Infiltrating tumors often give rise to retention of urine, usually partial retention, especially when they are situated near the internal meatus. When cystitis is present, and especially in cases in which there is ulceration of a malignant growth, the suffering is quite severe. Renal symptoms may also occur in the advanced stages where the growth is located about the ureter and interferes with the flow of urine. This gives rise to pain in the renal pelvis due to retention of urine at this point. In other cases, when cystitis is present in the bladder, a pyelo-nephritis or a pyonephrosis may occur in the kidney on that side, giving rise to pain, enlargement of the organ and febrile manifestations. (See Fig. 448.)

**Course.**—The course of vesical tumors is variable, the average duration of a malignant growth being from three to five years. Some patients die within a few months, due to frequent hemorrhage or to an associated cystitis and nephritis. On the other hand, patients with a benign tumor of the bladder may survive for fifteen to twenty-seven years. Cancer kills by exhaustion, hemorrhages, extension and metastasis. The growths often do not change in character, as is seen by repeated cystoscopic examinations. The tumors may be very small and yet give rise to quite profuse and continuous hematuria; whereas, in other cases, a tumor may be as large as an egg and cause very little bleeding. Frequent hemorrhages are, however, the cause of the impairment of the patient's health. In some cases, the hematuria is constant, the urine having a sirupy appearance and being darker in color than normal urine. The typical cachexia of malignant disease is noted in many cases, and the emaciation may be rapid.

**Complications.**—The complications of vesical tumors are hematuria, retention of urine and infection. When infection has taken place, it generally shows itself as a cystitis, or an ascending renal infection, usually a pyelonephritis. A suppurative pericystitis occasionally occurs. Uremia is a very frequent complication in cases in which the two kidneys are affected, and one of the organs is almost entirely shut off.

**Diagnosis.**—The diagnosis is based upon the symptoms and the history of the case, but must be confirmed by examination. Fragments of tumor tissue passed in the urine, together with bladder epithelia in cases where there are no evidences of inflammation or a new growth in the kidney or other part of the urinary tract, point strongly to tumor of the bladder, especially when associated with abundant hemorrhage or the passage of irregularly shaped blood clots. The blood, pus and urine coming from a bladder that contains a tumor

are often so mixed as to represent a very characteristic sirupy fluid, upon the mere inspection of which I have made the diagnosis.

Numerous cases of bladder tumor are diagnosticated as cystitis and the character of the growth is not determined even after the bladder has been opened suprapubically. This is especially apt to be the case in the infiltrating variety of tumor, and also in sessile growths attached by a broad base. Some time ago I examined a patient who had had both a suprapubic and perineal cystotomy performed without the diagnosis of tumor having been made, and yet I was able to see two sessile tumors by cystoscopy, which was done through the perineal fistula. These two tumors evidently had not sprouted above the bladder surface at the time of the suprapubic cystotomy which had been performed by a very competent surgeon.

Examination.—A cystoscopic examination is the most important step to enable one to diagnosticate positively the presence of a tumor, and it is only in rare cases that a satisfactory view of the growth cannot be obtained. Sometimes, however, the bleeding is so constant, or the accompanying cystitis or suppurative disease of the kidney may cause so much turbidity, that it is difficult to see the tumor, even after washing the bladder many times. The points that can be ascertained by cystoscopic examination are whether the involvement is single or multiple, the location, extent and surface of the tumor, as well as the condition of the surrounding mucous membrane. The seat of the tumor is easily determined after having located the bladder orifice, the trigone and the interureteral band. The size of the growth is often difficult to determine, as changes in the position of the cystoscope tend to make it look larger or smaller.

Cystoscopy affords the best view of the sessile growths, the tumor appearing as a lustrous body of an orange color and luminous (Fig. 450). Sometimes it is bathed in pus or phosphates, and the glow of the growth shining through this reminds one of the cone of a volcano. In the pedunculated variety, the waving villi can be seen to move about with each jet of urine coming down through the ureters. The long streamers look like tendrils or the waving branches of an aquatic plant (Fig. 445). They are also luminous. In the infiltrating tumors, the bladder is often very intolerant and it is difficult to obtain a good view of the interior. These tumors are not as striking as those previously described. They are flattened out, but slightly elevated, and have an irregular red surface often like coral or the red part of a lobster. In other cases, they are not red, but have a dull gray color. Sometimes they are ulcer-

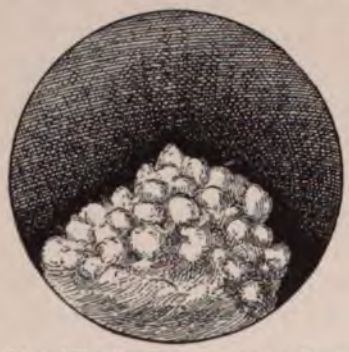

Fig. 450.—Sessile Tumor as Seen by Cystoscope. (Cystophotography.) (Legueu.)

ated. After a vesical tumor has once been seen, the picture can never be forgotten, as there is nothing resembling it, not even a solitary ulcer, which is most frequently mistaken for a tumor.

It is not always possible, however, to judge if a pedunculated tumor is benign or malignant. Some time ago I had two cases of pedunculated papilloma of the bladder, one in a man fifty-five years old, the other in a man twenty-seven years old. In both cases, the growth was situated just above the right ureter. The trunk and the streamers of each case were the same size, and yet, on their removal, the diagnosis of these tumors by the pathologist was a benign growth in the young man, and a malignant one in the older patient.

Other methods of examination are by palpation and by exploratory incision. A combined recto-abdominal examination by bimanual palpation, with the patient on the back or standing up and leaning on a table, will often permit the palpation of a malignant tumor when the bladder is empty. I have been able to palpate tumors of the bladder in men by bimanual examination, two fingers in the rectum and those of the other hand over the pubes in such a way as to be able to outline the growth exactly and to tell the nature of it, as was determined later by cystoscopy. In women, bimanual palpation is much easier by placing the fingers of one hand in the vagina and those of the other hand on the abdominal wall. An exploratory incision is usually conclusive.

**Differential Diagnosis.**—Tumors of the bladder should be differentiated from stone, tuberculosis and hypertrophied prostate.

The disease differs from stone in giving rise to attacks of hematuria that are more profuse and come on independently of motion; there is less pain and frequency of urination, besides which, tumor fragments and atypical cells are seen in the urine. During the intervals of the attacks of hematuria, the urine in vesical tumor may be perfectly clear, or it may contain numerous blood corpuscles, epithelial elements or tumor fragments. No shadow is seen on radiography. Cystoscopy shows us which is present.

Vesical tumor differs from tuberculosis in that the hematuria is more profuse and there is less pain and frequency of urination in the former; tumor fragments are present, whereas no tubercle bacilli are found either on urinary examination or guinea-pig inoculation.

Tumor of the bladder differs from prostatic hypertrophy in that the hematuria is more profuse, the frequency of urination less marked at night, the urine contains tumor fragments and the prostate gland is not generally enlarged.

**Prognosis.**—The prognosis is grave in all forms of vesical tumor. The general health is always imperiled by the hematuria and also by the infection which usually takes place and very frequently involves the kidneys. The prospects are much more favorable in a circumscribed growth than in a diffuse one. A polypoid tumor is much easier to handle than a dense infiltrated growth. The chances of recovery are better in pedunculatd growths than in those ex-

tending below the mucous membrane. Benign growths are frequently transformed into the malignant variety. In fact, I have had such an unfortunate experience in the treatment of tumors, that in my opinion nearly all benign tumors in youthful patients will become malignant if allowed to remain, or will recur if they are removed, unless the part of the bladder wall on which they are situated is removed together with the tumor.

**Treatment.**—The treatment of bladder tumors is palliative and surgical.

Palliative Measures.—Palliative measures are used in the management of the symptoms and complications of the disease. They are also indicated in cases in which there is no visible tumor, and when the growth is situated at the base of the bladder or has extended to the paratrigonal spaces and the prostate gland. Palliative expectant treatment should be adopted while the patient is under observation, except in emergency cases, such as severe hemorrhage or dangerous involvement of the vesical neck, the urethra or the kidney. It includes the keeping of the patient in the best possible physical condition, by regulating his manner of life. Patients with bladder tumors often live for many years in comfort without surgical interference, who might not have survived a radical operation.

Surgical treatment aims at the cure of the patient by the operation, but in many cases it is evident that this is not possible and the operation is performed simply as a palliative procedure. The symptoms principally requiring palliative treatment are hemorrhage, pain and tenesmus.

*Hemorrhage.*—Hemorrhage is the most prominent symptom of bladder tumor and may occur in a varying degree, from a pinkish tint in the urine to a loss sufficient to endanger the patient's life. Treatment should be instituted as soon as the blood is noticed, as it is impossible to tell at the beginning of a hemorrhage just how severe it is going to be. Rest at home is then important, and the patient should be put on a bland diet, such as milk and Vichy. A prescription may be given of 15 grains of calcium chlorid every two or three hours, depending on its action (Bellevue); or tincture of iron, 15 minims, and fluid extract of ergot, 15 minims, every three hours, or double the amount three times a day. Gelatin is given in 1- to 4-drachm doses three or four times a day in milk. When the ordinary cooking gelatin is used, it is necessary to give twenty or twenty-five times this amount, as cooking gelatin contains but a small fraction of pharmaceutical gelatin. Hence, in the administration of milk and cooking gelatin, it would be necessary to use from half a cupful to a cupful each time. Personally, I prefer the mixture of ergot and iron internally and only give chlorid of calcium and gelatin before operations in which I look forward to considerable hemorrhage. If the bleeding does not stop or decrease, further procedures should be resorted to, such as hypodermics of ergotin.

For *local treatment,* a woven catheter with a large eye should be introduced and an attempt made to aspirate or suck out any blood clots present in the blad-

der. If none come away by aspiration, a small quantity of hot saline should be introduced into the bladder and the catheter should be worked about gently in an effort to break up the blood clots without causing extra hemorrhage. Hot silver solution (1:1,500) may stop the bleeding by its astringent action. A solution of alum is even better, made of 1 drachm of Squibb's camphorated alum and 8 ounces of hot water. These bladder irrigations may be given through a double-current catheter; or a prostatic douche tube which has a sprinkling stream; or an evacuator such as is used to remove pieces of stone after lithotomy. Gelatin may be used locally, 3 ounces of Merck's sterilized gelatin, two-per-cent solution. In case the hemorrhage does not cease, the bladder should be cleaned out as well as possible, and adrenalin injected just as it comes in the tube, equivalent to a strength of about 1:1,000, or three parts of water may be added, which is usually sufficient. Two years ago, one of my patients, a man of middle age, with a bladder tumor the size of an egg, had a hemorrhage of so serious a nature that he was nearly exsanguinated, and it was thought necessary to perform a suprapubic operation and pack the bladder. One injection of adrenalin, however, stopped the bleeding so effectually that there was no hemorrhage for several weeks afterwards, at the end of which time he was operated upon and the growth removed.

I have never had to perform a suprapubic cystotomy and pack the bladder in cases of hemorrhage due to bladder tumors, although I feel it is the most effective palliative procedure. It is extremely dangerous when the patient has lost considerable blood and should only be done as a last resort. On one occasion, I opened the bladder from below in a case of severe hemorrhage, and, although I succeeded in stopping the hemorrhage and evacuating the clots, if I had a similar case again, I would do the work through a suprapubic incision.

*Pain.*—Spasm, sometimes painful, and also tenesmus, are symptoms often more distressing to these patients than hemorrhage, for although the loss of blood is weakening, they generally rally from it quickly without having suffered much physical discomfort, except when the bladder is full of clots giving rise to retention of urine and interference with the bladder contractions. In patients who suffer from attacks of painful spasm, the function of the bladder is interfered with, sometimes causing delay in urinating, and at other times retention of urine, accompanied by the painful spasm. I believe that the cases, characterized by symptoms of this kind, in the absence of hemorrhage, are referable to infiltrating tumors rendering the bladder wall inelastic, rigid and unyielding. In some of these cases, I have seen vesical tumors with the cystoscope, and do not doubt but that such have escaped my attention in the bladders of other patients having these growths. The nearer such tumors are to the vesical orifice, the greater the disturbance caused by their presence is wont to be.

Pain and tenesmus are also caused by another class of tumors, the pedunculated growths near the mouth of the bladder, which crowd against the internal meatus during the act of micturition. I had one such case, following a Bottini operation, referred to at the beginning of this chapter.

Palliative treatment in these cases of difficult urination with spasm consists in the administration of antispasmodics, such as tincture of belladonna, tincture of hyoscyamin, morphin, chloral and bromid. The vesical sphincter may be stretched with a Kollmann dilator. If associated with prostatic disease, massage of the gland is indicated. The infiltrating cases can also be treated by massage of the prostate and the posterior bladder wall, in case the tumor is situated in this region and does not give rise to hemorrhage.

*Infection.*—When infection takes place, causing a cystitis, the pain and tenesmus are usually much increased in severity, and may become almost unbearable. Under these conditions, the bladder should be washed out as often as necessary with solutions of nitrate of silver followed by an injection of twenty-per-cent argyrol.

The suffering from such a complication, in the shape of tenesmus, pains radiating to the glans, perineum and lower limbs, is often so intense that the local bladder irrigation cannot be well borne, while antispasmodics, such as morphin, codein, belladonna or laudanum are of little value.

Rectal suppositories of extract of belladonna and
morphin ..... each ¼ of a grain

Or,

Rectal injections of antipyrin ..... gr. xv

are often of no avail, and a perineal or suprapubic palliative operation for drainage is resorted to. I have recently had under observation a patient in such a condition, with widespread malignant disease of the bladder, upon whom a palliative suprapubic operation was performed without relief. This was followed a year after by a perineal operation for drainage. The suprapubic wound closed and the patient has been going out of late with a large-sized perineal tube (38 French) passed through the perineal opening into the bladder, which is retained there and drains into a urinal fastened to his leg. With this method of drainage he is now comparatively comfortable and is able to go about to dinners, theaters and elsewhere.

*Complications.*—These may be due to the vesical tumor itself, or to its spreading to adjacent tissues. Tumors of the bladder are often complicated by certain other conditions, vesical retention, renal retention, hydronephrosis, as well as by other secondary changes in the genito-urinary tract besides cystitis, such as involvement of the prostate and vesicles, pyonephrosis, pyelo-nephritis and renal atrophy. The vesical retention is due to urinary obstruction through

involvement of the prostate and lack of contractibility of the bladder wall, or to the direct interference on the part of the tumor itself, and may be relieved by catheterization, if the retention is complete. In the case of partial retention with a bad cystitis, the urine should be drawn off once or twice a day and the bladder washed out with silver solution or boric acid. I have now a case of malignant secondary growth from the prostate extending into the bladder, which is washed out twice a day with silver solution through a catheter, and as yet there has been no bleeding.

The renal complications are due to pressure of the growth on the vesical ureteral orifices, causing interference with the flow of urine and a secondary infection of the kidney of an ascending or hematogenous nature, requiring operative interference. The treatment of complications of the prostate and vesicles depend on the variety of the tumor; if the growth is secondary to a tumor of the prostate, the gland should be removed with the tumor if possible. (See Fig. 441 B.) In the case of a bladder tumor arising from an inoperable prostatic growth, on account of its having involved the adjoining tissues to so great a degree, a bladder valve should be made in the anterior wall of the bladder.

A bladder tumor in the female, involving the uterus, vagina or peritoneum, is usually too far advanced at the time the diagnosis is made for a radical cure by operation, as is a vesical growth involving the rectum in the male; but uterine tumors involving the bladder can be removed from its wall by hysterectomy.

Operative Treatment.—The question whether or not a given case of vesical tumor should be operated upon cannot be settled without taking into consideration the different types of tumors; their size, shape and location; the symptoms produced by them; the existing or anticipated complications; and the age and general condition of the patient. In certain cases, a vesical tumor causes but little inconvenience, whereas in others the suffering may be unbearable or the patient's life may be constantly threatened by hemorrhage. These factors, as well as the patient's fitness to withstand surgical interference, have a direct bearing on the question of operation. Again, it must be kept in mind that an originally benign growth may undergo malignant transformation. The tumor may extend into the vesical cavity growing from a slender pedicle, in the case of pedunculated tumors, or from a broader base in the sessile variety.

Tumors of the infiltrating type occupy a more extensive area, making the affected part of the viscus thick, rigid and unyielding. The part of the tumor seen through the cystoscope is but slightly elevated, with a base of a corresponding size or even larger in the bladder wall. The growths may occupy either the lower or upper vesical hemisphere, or the anterior or posterior half of the bladder; all of which have a direct relation to the ease with which they can be removed.

The operative methods in use are the following:

(1) Removal through the dilated urethra in women.
(2) Removal by a vagino-vesical incision.
(3) Removal by perineal cystotomy.
(4) Removal by means of the operating cystoscope of Nitze.
(5) Destruction by fulguration.
(6) Removal by means of suprapubic cystotomy.
(7) Removal by partial cystectomy (resection).
(8) Complete cystectomy (extirpation).
(9) Nephrostomy.

*Removal of Tumors through the Female Urethra.*—Tumors of the bladder in women are sometimes removed after dilating the urethra by means of forceps and tearing the tumor off piecemeal. This seems to be rather a crude and blind way of removing such growths, hardly likely to be employed at the present day, when we can employ instruments of precision in our bladder work, such as form a part of the various operating cystoscopes or the method of destroying the tumors by the high-frequency spark.

*Removal by a Vagino-vesical Incision.*—The vagino-vesical method consists in making an incision through the anterior wall of the vagina and the posterior wall of the bladder, and removing the growth by this route. This method does not appeal to me as a good surgical procedure for removing a vesical tumor, except in the cases in which small tumors are located on the posterior wall of the bladder above the trigone in such a position that they can be removed with part of the posterior bladder wall.

*Removal by the Perineal Route.*—Sir Henry Thompson, in the last quarter of the last century, recommended the removal of bladder tumors in men through a perineal incision. With the scientific advances in diagnostic and operative technique, this operation at the present date does not meet with the approval of the modern surgeon, who prefers to perform exact work by direct vision rather than work in the dark by the sense of touch.

*Removal by Means of the Operating Cystoscope.*—The endovesical removal of tumors of the bladder was devised by Nitze, who constructed snares and cautery tips that could be introduced through a cystoscope for catching and removing the growths. The method was recommended by Nitze for the benign growths only, as it is not applicable for infiltrating malignant tumors at the base of the bladder. Casper operated in this way on thirty patients, with the galvano-caustic snare, and does not regard the method as dangerous. Tumors at the vesical base and on the posterior vesical wall are the most favorable for this procedure. He comments on the very slight loss of blood and reports a series of perfect cures by this treatment. One hundred and fifty cases operated upon by means of the cystoscope were reported by Weinrich, who says

that even tumors the size of an orange can be removed in this way. Among the 150 cases, there were 18 recurrences and 1 death.

*Fulguration.*—This is at the present writing quite extensively used for the destruction of vesical tumors, and bids fair to become of great assistance in the treatment of these growths. In treating tumors by fulguration, the Oudin current derived from a high-frequency machine is used. We are much indebted to Beer for his pioneer work in the fulguration of tumors and are glad to know that his end results have been so satisfactory.

*Removal by Suprapubic Cystotomy.*—Notwithstanding the fact that the suprapubic operation is more dangerous than either the perineal or the intravesical method, it is the most thorough procedure and the one that is probably the most practiced to-day. The technique of performing the operation will be found in the chapter on Bladder Operations.

Hemorrhage is a factor in tumor operations that should always be borne in mind. The bleeding may occur at the beginning or at the end of the operation. The disproportion at times between the size of the tumor and the amount of hemorrhage was impressed upon me by the following case (Fig. 451):

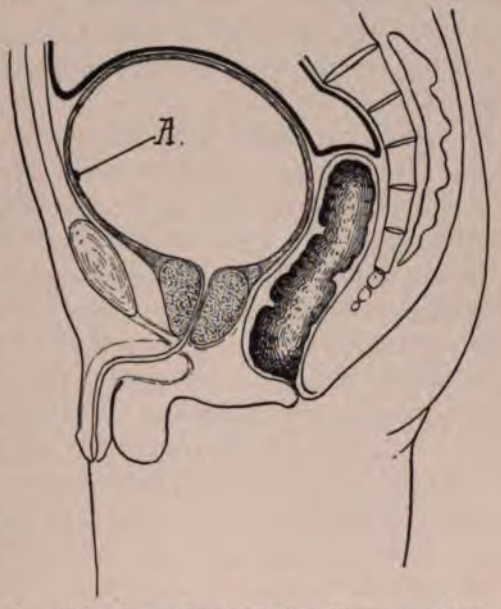


Fig. 451.—Very Small Tumor Causing a Very Great Hemorrhage, Which Could with Difficulty be Found at Operation. *A*, tumor.

The patient, a salesman twenty-two years of age, had a bladder tumor and was passing a light-brown sirupy urine, in which had been found bladder elements and small fragments of tumor. I had cystoscoped this patient, after a long time spent in washing out his bladder, but could not see the tumor. I could catch a glimpse, however, of a dark area on the anterior surface of the bladder, near the right side, and then the field rapidly became obscure again. A few more attempts to wash out his bladder sufficiently to obtain a good view met with the same result, and as there was a large amount of blood in the urine at the time, I decided to perform a suprapubic cystotomy. When I opened the bladder, a large quantity of bloody fluid gushed out. I hastily put in traction sutures on either side, drew the walls apart and poured in a large quantity of very hot water until the hemorrhage ceased. After this, I put in retractors on either side, opened the bladder wound as wide as possible and began to hunt for

the tumor, but with no result. I finally concluded that there had been a mistake and no bladder tumor was present. I took off the retractors and was about to close the bladder wall when the house surgeon noticed on the side of the wound on which I was standing a small piece of shriveled tissue. On bringing the sides of the wound together, a corresponding piece of shriveled tissue was seen on the opposite side, and the two met in the median line, forming a small tumor about the size of a French pea. This was removed. The patient made a good recovery, and seven years afterwards had never had a return of the hemorrhage.

It was a lesson to me that very hot water, as well as peroxid of hydrogen and adrenalin tends to shrivel small pedunculated tumors with fine proliferations.

The most profuse hemorrhage that I have ever experienced in removing a tumor from the bladder was in a case of a sarcoma with a fairly thick base (Fig. 444). It was exceedingly difficult to control, and was finally arrested by hot-water packing and repeated cauterizations. In another case, after removing the growth and treating it with the Paquelin cautery, there was a small artery that persisted in spurting. An artery clamp was left on this vessel for twenty-four hours after removing the tumor from the interior of the bladder.

After removing a tumor by suprapubic cystotomy, I close the bladder and abdominal walls, leaving only space for a drainage tube in the lower angle of the wound until the urine coming from it has lost its bloody tinge.

*Removal by Partial Cystectomy.*—The trend of operative work in cases of vesical tumor seems to be the removal of part of the bladder wall with the base of the growth. This is easy when the growth is situated in the anterior wall of the bladder, but when it occupies the posterior surface about the base, it is extremely difficult to accomplish. In this operation, the bladder can be entered by a vertical or a transverse incision, the latter if the tumor is very large and more room is needed. In case the tumor is situated in the base near the ureter, a catheter should be introduced into the ureter, and the growth and ureter should be dissected away at the same time, after which the duct can be separated from the diseased mass and implanted in the bladder wall or the bowel, or elsewhere.

*Total Extirpation of the Bladder.*—This operation has been performed about thirty times, and is indicated, if at all, in extensive malignant growths involving the base of the bladder. The results are very unsatisfactory, and unless the technique is improved, it cannot be recommended. The various operators who have performed total cystectomy have differed somewhat in their manner of operating. (See chapter on Bladder Operations.)

*Nephrostomy.*—The establishment of permanent lumbar urinary fistulas, by simultaneous bilateral nephrostomy, is recommended by Watson as a preliminary procedure to total extirpation of the bladder in malignant disease of the organ.

The lumbar nephrostomy is first done on one side, and if this is well borne the other side is operated upon. The ureters are ligated close to the renal pelvis. At the end of a month or six weeks, the bladder as well as the prostate gland and seminal vesicles, if involved in the growth, may be removed. In the presence of inoperable tumors, the bladder should not be touched, and the patient should be made as comfortable as possible with his kidney drainage.

Having become impressed with the large number of benign vesical tumors that have undergone malignant change, Watson points out the advisability of treating all these cases as though they were malignant, that is, by radically removing the diseased area through the performance of total extirpation of the bladder, together with double nephrostomy. In nephrostomy, there is much less liability to infection than in ureteral implantation, and with suitable care patients may go on unharmed for years with a renal fistula. Watson reports the case of a patient who has been draining for twelve years and is in excellent health and also free from all urinary odor. Among forty-four cases collected by him, a large proportion survived for several years in comfort and well-being. Morris reports two cases with a double renal lumbar fistula, the patients remaining in good health and comfort seven and sixteen years respectively after the operation.

It is claimed that the disability following upon nephrostomy has now been overcome, and that patients can be kept absolutely dry. In one of the hospitals with which I am connected, we have a rather large number of kidney cases, and there is generally some one patient with urinary leakage in the loin. Patients are occasionally kept absolutely clean in the hands of competent internes, who keep them dry by the use of layers of vaselin, gauze, rubber tissue and adhesive plaster, so that they drain through a tube into the bottle at the side without difficulty. Such a dressing is exceedingly difficult to apply and retain, and I am therefore glad to know that Watson's apparatus has been found so successful, and will replace the dressings and appliances at present in use.

I think more attention should be given by our cystoscopists to the intravesical work by fulguration and by means of the operating cystoscope in the radical treatment of tumors of the bladder.

Whenever it is possible to remove the growth with the part of the bladder wall from which it springs, this should be done, as it is the best of all the procedures in the surgery of bladder tumors.

I believe that nephrostomy will in the future be as important an operation in cases of malignant tumors of the bladder as colostomy is at present in malignant diseases of the rectum. I also believe that malignant tumors of the bladder situated about the mouths of the ureters should not be excised, nor should the bladder in these cases be extirpated; but when through the pressure of the growth on the ureter of that side, the corresponding kidney begins to develop a renal retention, a nephrostomy should be performed on that kidney, and lum-

bar drainage established. In the treatment of bladder tumors, we must be conservative and not too radical in our operative procedures. Casper says patients generally do better and live longer without than with operation. I am inclined to believe that he is right in advanced malignant cases. In any case, I always feel like heaving a sigh when a patient with tumor of the bladder is brought to me for operation. After the operation, in malignant cases, the recovery is usually satisfactory, but is followed later on by a recurrence. I have had malignant cases who have gone five or six years after operation without an attack of hematuria. In benign cases operated upon, some have never had an attack of hematuria, while others have had a recurrence in from four to ten years. I consider that a great advance has been made in the treatment of bladder tumors by the use of fulguration.

# CHAPTER XLI

## FOREIGN BODIES IN THE BLADDER

All objects that have reached the bladder by means of a traumatic or spontaneous perforation of its walls, or through the natural passages, are designated as foreign bodies. A vesical calculus often forms around a foreign body, which serves as a nucleus.

**Etiology.**—This differs according to the point of entrance, which may be through a wound, a fistula, or by way of the urethra.

Foreign bodies reaching the bladder through a wound are bits of metal, such as fragments of explosives; spent bullets (which may remain imbedded in the vesical wall and only reach the cavity through subsequent ulceration); shreds of clothing; splinters of bone; or the point of an instrument, as that of a catheter, broken off and left within the organ.

Fistulas, giving rise to foreign bodies in the bladder, are connected with the gut (recto-vesical fistula). In such cases, the bladder may contain fecal matter; products of incomplete digestion, such as raisin seeds, orange peel, etc.; also intestinal parasites. Infection of the bladder with the colon bacillus, through an intestino-vesical fistula, always follows. The urine may remain clear for a long time, notwithstanding the fact that there is a free communication between the bladder and the bowel.

Among other foreign bodies that have been discharged into the bladder from its outside, are fetal remnants from a ruptured extra-uterine pregnancy; secretions from hydatid and dermoid cysts; and also pieces of bone from a bone abscess. The ends of silk ligatures that have been used in the ligation of the pedicle in laparotomies have also been known to penetrate the vesical wall directly, or reach the cavity by rupture of an abscess. They frequently become the nucleus of vesical calculi.

Foreign bodies that have found their way into the bladder through the urethra are broken pieces of catheters and other instruments that have been introduced for surgical purposes, and objects such as penholders, lead pencils, knitting needles, bits of wood, straws, twigs, nails, beans, hairpins, thermometers, etc., that have been introduced for unknown reasons. The only case of foreign body in the bladder that has been connected with our clinic during

the last ten years, was that of a piece of banana peel. The man had pushed a thin piece of the peel into his urethra to see how far it would go; but it entered far-

FIG. 452.—PIECE OF BANANA PEEL THAT A MAN HAD INTRODUCED INTO THE URETHRA, WHICH ESCAPED FROM HIS GRASP AND ENTERED THE CAVITY. (Two thirds actual size.) (Author's case.)

ther than he intended to introduce it, and disappeared from sight. Fig 452 shows a drawing, reduced one third, of the piece of banana peel that was removed from the bladder. Fig. 453 shows the X-ray picture of a nail that was removed from the bladder by Dr. John Van der Poel.

FIG. 453.—DR. JOHN VAN DER POEL'S CASE OF A PATIENT WITH A NAIL IN HIS BLADDER. As seen by radiography. Removed by a suprapubic incision.

The relatively short urethra and yielding sphincter of the female account for the ready penetration of foreign bodies into the bladder. In the male, as soon as the foreign body has passed the bulbous urethra, the contraction of the membranous portion pushes it promptly toward the bladder, as in the direction of least resistance.

**Pathological Anatomy.**—There are three points of surgical interest: (1) The position of the foreign body; (2) its modification by incrustation; (3) the secondary vesical lesions it gives rise to.

The position of a foreign body in the bladder varies with its character; flexible bodies adapt themselves to the vesical contour, while hard and rigid objects assume a position dependent on their length. When less than five inches (12 cm.) long, they take a position following the transverse axis of the organ, near the neck. When over five inches in length, they are obliged to double up

against the vesical walls or become immovably imbedded in the wall of the bladder. Objects such as hairpins may retain partial mobility.

The final modification of the foreign body in the bladder generally consists in its incrustation. Within a few days after its introduction, a deposit of ammonio-magnesium phosphate appears, first upon the surface irregularities, and always most distinctly marked on the middle portion of an elongated body. A rough uneven surface facilitates the deposit of the crystals.

A foreign body may pierce the bladder at the time of introduction. Generally, however, vesical perforation is secondary, and a result of cystitis. When the bladder is aseptic, it may be exceedingly tolerant of a foreign body. Infection once established, the foreign body constitutes a constant source of irritation. Ulceration of the mucosa from friction may give rise to a secondary perforation of the bladder.

**Symptoms.**—During the stage of tolerance, symptoms are absent; but after infection has taken place, they are those of a mild or severe grade of cystitis. Transitory symptoms of vesical irritation may occur at the time of the entrance of a foreign body, or during the period immediately following it. After this, tolerance may persist during many years.

Foreign bodies sometimes work their way out of the bladder spontaneously through the soft structures. This has occurred in rare instances through an acute vesico-vaginal fistula, or through an abdominal fistula after a vesical perforation and the opening of a perivesical abscess. They escape, however, more often by the urethra. This occurred spontaneously in 28 of 87 cases of foreign bodies of traumatic origin reported by Bartels. A moderate incrustation on the foreign body does not interfere with its spontaneous elimination. In the female, the expulsion of the foreign body from the bladder is facilitated by the wider and shorter urethra, while in the male, the foreign body is frequently arrested in the urethra, where its presence may result in various complications.

**Diagnosis.**—A satisfactory diagnosis of this condition cannot be made without a thorough examination of the patient. Even where there is an apparently clear history of an instrument having been broken off in the bladder, the fragment must be located, in order to differentiate between the various possible positions in the bladder or in the urethra. The diagnosis is, however, quite simple. The patient is urethroscoped, and if the foreign body is in the urethra, it will be seen there. If the urethroscopic examination is negative, then a cystoscopic examination is made. If nothing is found by urethroscopy or cystoscopy, the examiner can feel quite positive that no foreign body is present in the bladder. If, however, he is desirous of making a still further examination, he can have the patient radiographed.

In case of a hard body having been introduced into the bladder by the patient, a vaginal examination in the female, or a rectal examination in

the male, is usually sufficient to determine its presence by bimanual palpation.

**Treatment.**—Foreign bodies of traumatic origin should be extracted as soon as the diagnosis has been made. On account of the peculiar mechanism of fixation in the antero-posterior diameter, the extraction is more easily accomplished from an empty or half-filled bladder, as at this stage of repletion the foreign bodies are apt to assume an oblique or transverse position in the viscus. Extraction by the urethra should be first attempted. This is much easier in the female, on account of its shortness, its width and its rectilinear direction. It can, however, also be accomplished in the male.

Methods of Extraction by the Lithotrite and the Cystoscope.—In extraction by the lithotrite, the instrument is introduced and the foreign body is grasped and gently withdrawn. This is easy in case it is a piece of catheter or a small, short body; but it is exceedingly difficult to remove a long body in this way. The operator must possess great patience, and manipulate the instrument gently, to avoid injuring the bladder. It is necessary to grasp the foreign body near its end, and if possible seize the end itself, in which case it can usually be quite easily withdrawn. It may be necessary, however, to grasp the body thirty or forty times before it is seized in the right way and at the proper angle to enable the operator to withdraw it. The late Dr. Cabot devised an extracting device for a cystoscope resembling two fingers, by means of which the end of the foreign body can be accurately grasped and withdrawn. A similar device is now used in the Ayres cystoscope.

In the case of the man coming to the clinic with a piece of banana peel in his bladder, Dr. Schapiro, who was in charge of the cystoscopic room at the time, extracted the piece of peel by introducing a small cystoscope, catching the middle part of the foreign body, drawing it up into the urethra and gradually working it out.

In case a foreign body cannot be extracted, it should be removed by operation, either by a perineal or suprapubic cystotomy, depending on the size and shape of the foreign body. Incision is only exceptionally required, as a method of emergency.

The method of removing an old incrusted foreign body varies according to its shape, size and consistence. If soft and friable, it should be crushed by means of the lithotrite and treated like a calculus. If the object is wood or metal, an effort should be made either to extract it by means of a lithotrite or to crush it and remove the pieces. If both these efforts fail, then it should be removed by operation through a suprapubic bladder incision.

# CHAPTER XLII

## VESICAL CALCULUS

**Etiology.**—There are two varieties of stone in the bladder, primary and secondary. Primary stones are generally uric acid, oxalic, xanthin or cystin. They are formed in the kidney, and descend to the bladder. They are the result of a general disturbance of metabolism due to too much proteid and carbohydrate food, lack of exercise with the resulting suboxidation. Secondary calculi are formed in the bladder, and are due to a chronic inflammation of its walls and retention of urine. Once infected, the urine easily becomes ammoniacal, and the decomposition of urea is the starting point for a series of chemical transformations terminating with the precipitation of phosphates. In the presence of ammonia liberated by the decomposition of urea, the soluble magnesium phosphate is changed into ammonio-magnesium phosphate, which being insoluble in alkaline fluids, becomes precipitated, as well as the phosphates of calcium. Hence these secondary calculi are almost invariably formed of the phosphates or carbonates of calcium, magnesium or ammonium.

Foreign bodies in the bladder, such as broken fragments of catheters, easily become the nucleus of large calculi by the deposit of urinary salts upon them. In the absence of all foreign bodies, the salts are precipitated around a blood clot conglomeration of cells and leucocytes, thus constituting the nucleus of a rapidly growing stone. Silk sutures used in closing the bladder wall may form a nucleus in case they pierce the mucosa.

Urinary retention, complete or partial, when infection is present, consequently favors the precipitation of phosphates. Hence these secondary calculi are met with especially in patients with strictures; in infected prostatics, who cannot empty their bladder, in women having cystocele and in paralytics whose bladders have become paralyzed and incapable of contraction.

A phosphatic diathesis has been spoken of by certain authors, but this is merely a theory and can be applied only to exceptional cases. Phosphatic calculi may form in the pelvis of an infected kidney with renal retention, and may descend to the bladder, in which case they are practically the same as secondary vesical stones.

Calculi are found more frequently in males than in females. Primary calculi may descend from the kidney as often in men as in women, but owing to

the shorter and wider urethra in the female they are more easily passed out in the urine than in men, and therefore less frequently found in the bladder. Vesical stone is prevalent between the ages of forty and sixty years, and is also more frequently observed in children than in early manhood.

In this country, vesical calculi are not often seen except in foreigners, and the majority of my patients were Italians. I have seen more cases of this nature in a general service at a small Italian hospital than in a very large special genito-urinary service in the second largest hospital in New York City, in which probably fifty times as many genito-urinary cases were admitted as in the Italian institution referred to. Calculi, both renal and vesical, are most frequently found in England, Holland, western France, Wales, Hungary, India, Egypt, Italy and some of the Spanish-American countries.

**Pathology.**—The number of calculi found in a bladder is variable. Uric-acid and oxalic-acid stones usually occur singly, while those of the phosphatic variety are more liable to be multiple. In size they vary from that of a pea to that of a hen's egg and even larger. The average calculus is about an inch in diameter and weighs from one half to one and one half ounces. The stones are generally oval in form and somewhat flattened. The surface is smooth and regular in the uric-acid variety; in the oxalic type it is roughened; while phosphatic calculi are more irregular in contour.

The consistency of bladder stones varies according to the material of which they are composed. In considering the three commonest forms, oxalic calculi are the hardest, next uric acid and then phosphatic concretions. In composition calculi are often of a mixed variety. The nucleus may be composed of blood, mucus and epithelial cells, or of a foreign body such as a suture or ligature. The deposit of crystals about the nucleus may have been first uric acid, then oxalic and afterwards phosphatic in character.

Calculi vary much in their appearance, and, when composed of but one salt, are more likely to resemble those found in the kidney. Uric-acid stones have a yellowish-red color, the cystin a yellowish gray, the xanthin a yellow or cinnamon and the carbonates an earthy appearance.

Vesical stones are usually freely movable and change their position according to the movements of the patient. Occasionally they are found in diverticula, and they may develop to such an extent in one of these hollows that they remain imbedded there and are not movable. These are called encysted or encapsulated calculi and are rare.

At other times calculi occur in what is called a prostatic pouch, that is, a space behind an hypertrophied prostate that has grown into the bladder. This space may be an inch or more in depth, and of a corresponding width. When the patient stands up, the stones fall into this pocket; when the patient lies down they fall back on to the trigone of the bladder. If the patient turns on his belly, the stones either rest on the back of his prostate, or else they

slip along the sides of the bladder on to the anterior wall, only to fall back again when the patient again assumes a dorsal or an upright position; for the prostate grows upward into the bladder toward the anterior wall, and there is no pouch anterior to it. A dozen or more calculi may be found in this location, but it is rare to find more than four or five (Fig. 454).

Calculi are sometimes immovable on account of the fixation of the nucleus. If the nucleus is a needle. pin or sharp instrument, it may become fixed in the

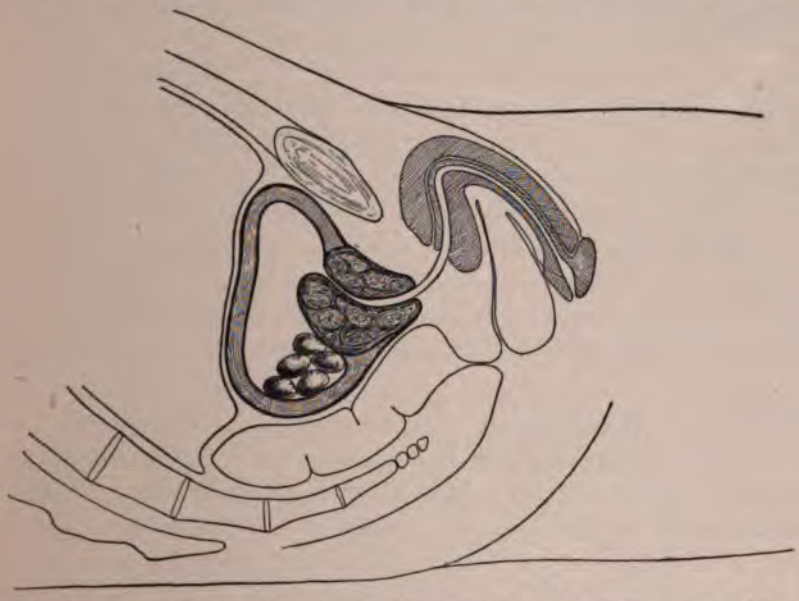

Fig. 454.—Stones in the Bladder behind Hypertrophied Prostate as they Appeared on Cystoscopic Examination. (Author's case.)

bladder wall, giving a definite position to the calculus. When the nucleus is a suture or a ligature following an operation on the organ, the calculus grows about that suture and remains suspended; or it may detach itself, and become a movable stone. I removed one of those stones that had formed on a suture used in sewing up a bladder that had been cut into in doing a hernia operation.

The calculus, especially if small and nonirritating, may be well borne for a considerable time by a healthy bladder. Sooner or later, however, cystitis develops, due to the traumatism caused by the stone or by the instruments used in the exploration of the bladder and the entrance of pus-producing germs.

In the chronic form of cystitis, the walls of the bladder become thickened and sclerosed; pericystitis may be present, and the inflammation may extend up the ureter to the pelvis of the kidney; erosions and ulcers of the bladder are sometimes found.

**Symptoms.**—The symptoms of vesical calculus are pain, disturbances of urination and hematuria.

The *pain* may be simply a disagreeable sensation, or it may be of the most distressing character. It is generally most marked in the glans penis when the patient is standing or voiding urine. It may be said that the rougher the stone, the greater is the irritation of the bladder wall and the more intense the pain. Therefore oxalic calculi produce the most pain. Phosphatic calculi also give rise to considerable suffering on account of their irregular outline, as well as through the ammoniacal urine which is present in the associated cystitis.

Calculous cystitis generally causes pain in the intervals between the acts of micturition; and when the patient voids urine, the suffering is intensified toward the end of the act, when the inflamed wall of the bladder contracts down upon the irregular surface of the stone. Micturition is rarely normal if a small calculus is present. It tends to gravitate to the vesical orifice when the patient is standing, and interferes with the flow of urine, causing certain interruptions in the stream. Sometimes the end of a calculus will so fit into the internal urinary meatus of the bladder as to stop the stream and give rise to a brief attack of retention, attended by great distress.

*Frequency of urination* is the most prevalent symptom. It may occur when the patient is up and about, every hour or half hour, or even less. The frequency and pain are especially marked when the patient is being jolted or jarred in his work; whereas at night, or during the day, when the patient lies down, the stone falls away from the neck of the bladder and the pain and frequency are not so severe. In vesical calculus, the frequency may at times be so marked as to almost constitute a false incontinence.

*Hematuria* is often the first symptom that causes the patient to consult a physician, as it is much more alarming than pain or frequency of urination. It is rarely profuse, and is due to the traumatism caused by the calculus on the bladder wall. Sometimes, when pain, hematuria and frequency are all present at the same time, a good picture of strangury is presented.

Occasionally, the symptoms of vesical calculus are few; in a patient recently brought to me, the only symptom was difficulty in passing urine.

The *urine* in a case of stone in the bladder depends upon the condition of the organ. If it is an aseptic case—that is, before the development of cystitis—it is clear and contains a few red blood cells, vesical epithelium, a few leucocytes, a small amount of mucus and crystals corresponding to those of which the calculus is composed. A small amount of nuclear albumin may also be found. When, however, cystitis has developed, there is a considerable quantity of pus and usually more blood; the urine is turbid and foul; masses of concretions, phosphatic particles or shells are present in addition to the aseptic findings.

The increased abdominal pressure employed in emptying the bladder and in overcoming the interference on the part of the calculus may bring about certain conditions, such as *inguinal hernia*, marked *hemorrhoids* or a prolapse of the rectum. I remember one patient who was in the habit of passing urine every few minutes in a squatting posture accompanied by such intense straining during the act, that he had a marked prolapse of the rectum and the entire surface distribution of the veins was plainly visible.

The *course* of a vesical calculus varies considerably. A small primary calculus shaped like a date pit, when there is no obstruction due to prostatic enlargement or stricture, may be passed spontaneously through the urethra, and the patient is cured. Occasionally, however, they fail to pass, but are caught in the urethra, giving rise to obstruction with, perhaps, acute retention of urine and its consequent painful symptoms.

Stones sometimes fracture or crumble spontaneously in the bladder and are eliminated by the urethra. This is an exceedingly rare occurrence. Such stones are usually composed of urates, or urates and phosphates. Various explanations for this phenomenon have been offered. It is thought that there may be an evolution of gas leading to an explosion, or that there may be a disproportion of colloid substance in the calculus, thus favoring its disintegra-

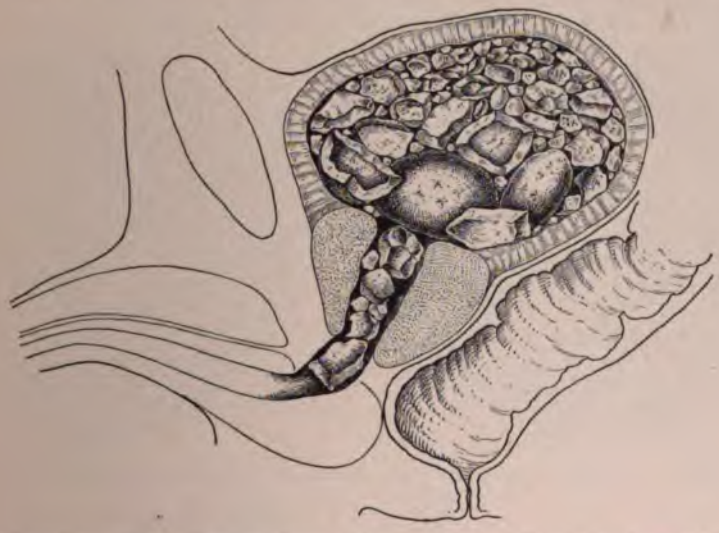

Fig. 455.—Spontaneous Fracture of Vesical Calculi in the Bladder, as it Appeared at the Time of Operation. The calculi resembled crushed stones as seen after a lithotrity. (Author's case.)

tion. It is claimed that the center of the concretion, not being moistened by the urine, may dry out, retract and crack in all directions from the center to the periphery. It was formerly supposed to be due to the contraction of the thick muscular walls of the bladder on the calculus. In one of my cases, there

was a spontaneous fracture of vesical calculi, and more than a hundred pieces were found in the bladder (Fig. 455). In this particular instance, there had probably been several stones, two of which were hard and acted as crushers of the softer stones. When the patient entered the hospital, his urethra was full of fragments of stone, and his bladder as well, while there was one full-sized stone two thirds of an inch in diameter and a smaller one about half its size that were not broken. As the wall of the bladder was very much hypertrophied and thickened, and its cavity small, I thought at the time that the stones had been pressed against one another and that the more friable had been broken by the two harder calculi. The calculi were removed by perineal cystotomy and were presented at the New York Academy of Medicine.

The calculus may also perforate the bladder during suppuration, or the abdominal wall as well, or it may perforate into the bowel, the vagina or the cellular tissue surrounding the bladder. In one of my patients, a calculus in a bladder diverticulum gave rise to a perforation through the posterior wall of the bladder, followed by a urinary leakage and a gangrenous peritonitis.

Superficial traumatism of the bladder wall, caused by the friction of the calculus or by the instrument used in treating or examining the organ, predisposes to the entrance of pus-producing germs. The cystitis accompanying stone in the bladder is not especially obstinate unless there is a chronic obstruction, generally due to prostatic enlargement, urethral stricture or other abnormal conditions that give rise to partial or complete retention. The inflammation of the bladder wall may extend to all its layers, and even to the cellular tissue about the organ—a pericystitis. If ulceration is present, the bladder may become perforated, giving rise perhaps to a peritonitis, as already mentioned. After the removal of the stone, the cystitis will usually persist for some time.

The symptoms of cystitis due to vesical calculus are diminished by rest and increased by motion, as is the hemorrhage. Similar hemorrhages may occur in patients suffering from renal calculus, but the pain is usually in the loin and not in the glans penis, the neck of the bladder or suprapubic region. Ureteral clots are absent in bladder cases.

**Diagnosis.**—Examination of the patient is usually sufficient to make a positive diagnosis of vesical calculus. In children, the stone is often detected by recto-abdominal palpation, but such a procedure is often not satisfactory in male adults, especially when the abdominal walls are thickened. A rectal examination will often enable us to palpate stones that have been impacted in a postprostatic pouch, particularly if the patient is examined in a standing position, with the body slightly flexed, when the characteristic crepitation will be experienced. Recto-abdominal bimanual palpation should be made a part of the routine examination of every bladder case, as it is often of the greatest

help in estimating the size and position of vesical stones and tumors. In women, the bladder is readily accessible by a vagino-abdominal examination.

A complete examination of the lower urinary tract is always indicated. The urethra should be examined by the bougie à boule and sounds, to see if any obstruction or stricture exists in the canal. A catheter should be introduced into the bladder in order to determine the presence of residual urine and its amount, if present. A stone searcher, turned in the bladder and hooked behind the prostatic base, will afford an idea of the length of the urethra and the presence of prostatic enlargement sufficiently marked to cause obstruction. Exploration with this instrument is much less frequently resorted to now than formerly. The manipulation of the stone searcher requires a horizontal position of the patient and a moderate distention of the bladder with fluid (50 to 150 grams). The instrument is carefully introduced through the urethra; then, upon reaching the bladder, the tip is first turned to the left and the upper zone of the hemisphere explored by rotating the searcher from side to side while gently pushing it from in front backward. It is then turned downward for the exploration of the lower zone of the hemisphere. The same procedure is then repeated on the other side of the bladder.

The cystoscope permits the carrying out of the same movements equally well, and moreover affords the possibility of a thorough and complete visual in-

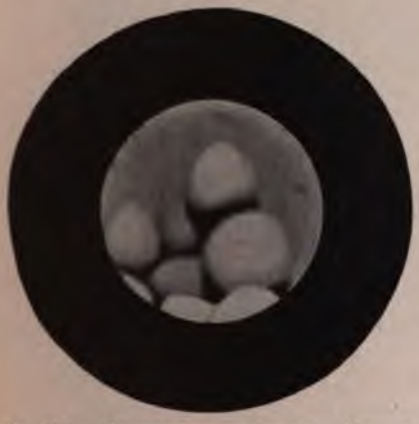

Fig. 456 A.—Cystophotograph of a Group of Small Facetoid Calculi as Seen through the Photographing Cystoscope. (Von Bergmann.)

Fig. 456 B.—Cystophotograph of Two Larger Stones Seen by the Same Means. (Von Bergmann.)

spection of the vesical interior, showing stones that are adherent to the bladder wall, imbedded in folds and diverticula or hidden in a prostatic pouch. These can be photographed by a photographing cystoscope, as is shown in Fig. 456 A and B.

Radiography is one of the most important methods for the diagnosis of vesical calculus. Fig. 457 shows the shadow of a large vesical calculus. In

view of the fact that the interior of the bladder may be scanned with the cystoscope, radiography would seem to be a superfluous measure; but it has shown the presence of vesical calculi after negative findings with both the stone

Fig. 457.—Radiographic Shadow of a Large Vesical Calculus.
(Dr. James Pederson's case.)

searcher and the cystoscope. I can understand how such calculi can be overlooked in cases in which the bladder is very intolerant and but a small amount of fluid can be retained that is not a sufficiently clear medium for cystoscopic examination on account of being tinged with blood or made cloudy by a large amount of pus. Besides this, a stone that is growing in a diverticulum pushes aside the tissue beneath the trabecular bands that border it, and may be so buried that it is difficult to see in the dark area if a stone is present or not. In the case of calculi in a prostatic pouch, the shadow thrown by the prostate over the area behind it is sometimes so great that it is difficult to throw the rays

of light behind it or to place the window of the cystoscope in such a position as to obtain a good view of the prostatic pouch.

I remember one patient with five stones behind his prostate, seen in consultation with three other urologists, two of whom could not detect the stone with a Nitze instrument (Fig. 454). Notwithstanding this and other similar cystoscopic mistakes, I personally would trust my cystoscope much more than a radiographic picture, for an X-ray plate often fails to show the shadows of uric-acid calculi, which are very common, although phosphatic, oxalic and cystin stones are plainly seen. At times, radiography does give us a clear idea of the shape and size of the calculus, but often it is not so much what you see as what you do not see that is important in radiographs. These pictures are most valuable in detecting vesical calculi in children, whose urinary organs are too small for a cystoscopic examination. Notwithstanding the different methods of diagnosticating vesical calculi, patients in large cities die and come to autopsy with large stones in the bladder. Fig. 458 shows a specimen of very large vesical calculus weighing three and three quarter ounces which I removed by suprapubic cystotomy, the patient making good recovery.

Fig. 458.—Large Vesical Calculus in a Chronically Inflamed Bladder, together with Pyelonephritis. Removed by suprapubic cystotomy. Weight 3¾ ounces. ⅜ actual size. (Author's case.)

**Treatment.**—The treatment of vesical calculus is prophylactic, palliative and surgical.

The prophylactic method consists in regulating the diet and giving remedies to correct the diathesis represented by the crystals of which the stone is composed. (See chapter on Metabolism.) For the palliative treatment of these cases, the reader is referred to the chapter on Cystitis, in which these remedies are discussed.

The management of vesical concretions by internal medication consists of giving certain solvents by the mouth, such as lithia, which are supposed to soften and break up the calculus; but claims to this effect have never been positively substantiated. The injection of dissolving fluids is no more efficacious. Nitric-acid solution has been named as a suitable remedy for dissolving phosphatic calculi, and this might possibly be accomplished; but in order to do so, the solution would presumably have to be of such a strength as seriously to damage the bladder wall. The various electrical methods for destroying calculi that

have been recommended are, to my mind, equally inefficient. Surgical interference is, therefore, the only curative measure that I can recommend. The three operative procedures are lithotrity, litholapaxy and lithotomy. The preliminary treatment consists in washing out the bladder and injecting three ounces of a 1 : 400 solution of cocain into the organ.

*Lithotrity* is the method of crushing the stone with a lithotrite and having the patient pass out as many of the fragments as possible after each crushing. For a long time this was the customary treatment, although each session was followed by considerable inflammatory reaction, due to the traumatism of the instrumentation and of the crushed fragments. Besides being painful and distressing for the patient, this treatment added to the danger of infection and complications.

When Bigelow devised the method of crushing and evacuating the fragments, it was a great boon to the surgical treatment of vesical calculus. He based his opinion of the wisdom of such a procedure on the size of the posterior urethra, which he had found to be sufficiently large to admit an instrument of greater size than the ordinary lithotrite. By passing an instrument of the maximum size through the canal, he was able to crush a calculus in a more thorough way, and then, by introducing a large-sized evacuator, to wash out the fragments. When strictures were present in the canal, they were dilated, and often it was necessary to cut them or the meatus to admit the instrument. It was my good fortune to have been a pupil of Bigelow and to have had an opportunity to watch and study many of his operations.

*Litholapaxy*, or the operation of crushing and removing the stone in the bladder in one sitting with the assistance of special instruments, is at the present day the best method of treating vesical calculus in adults, and statistics show that it has a lower mortality than any other operative procedure. The performance of litholapaxy requires a calculus freely movable in the bladder, as it would otherwise be impossible to grasp it between the jaws of the lithotrite. Sufficient vesical capacity is also necessary and the urethra must be of good size; otherwise, the litholapaxy should be preceded by catheterization, meatotomy or urethrotomy, according to individual requirements.

After the operation, a retained catheter is left in the bladder for a day or two. There is sometimes considerable hemorrhage, but the obstruction of the catheter is prevented by repeated flushings of the bladder with boric-acid or silver-nitrate solution, which in addition tends to prevent sepsis. The bladder should be flushed out night and morning for several days after the removal of the catheter, a saturated solution of boric acid being used. In uncomplicated cases, the patient should remain in bed for three or four days.

The troubles attending the operation are due to a narrow meatus, spasm of the perineal muscles, impaction of a fragment in the urethra, the jamming of a fragment in the evacuating catheter, a large calculus preventing the

operator from obtaining firm hold of the stone, the breaking of the male blade and rupture of the bladder. The complications are cystitis, urinary fever, retention, prostatitis and orchitis.

The crushing of the calculus is more difficult in women as it is usually performed, that is, with the blade turned upward and the heel of the instrument depressing the vesico-vaginal wall. It is more difficult to fix the lithotrite in place, as the fundus of the bladder, on account of the absence of the prostate, is not as firm in the female. The bladder is also of a more irregular form. The surgeon is, however, not often called upon to perform the operation in the female bladder, as the size and shape of the urethra are such that small stones are usually evacuated spontaneously, while fairly large calculi can be grasped with forceps and drawn through the urethra after its dilatation.

Perineal litholapaxy is sometimes performed. It is a combination of perineal urethrotomy and litholapaxy. The lithotrite is passed into the bladder through the urethral incision. It can be used in connection with a perineal external urethrotomy in the case of a deep-seated stricture complicated with vesical calculus, or in cases in which stones are present both in the urethra and the bladder. In the latter case, the urethral calculi can be removed through the urethrotomy incision, while the others are crushed by the lithotrite inserted through the wound into the bladder. I have done this operation but twice, and it seems to me a very practical procedure.

*Lithotomy* is the surgical operation that interests us most in this country, as vesical calculi are so rarely encountered that we do not have sufficient practice to become expert with the lithotrite. In New York City, with its numerous hospitals in which operations are performed daily, and at the Academy of Medicine, where the notices of many operations are posted each day, it is a very rare occurrence to see the announcement of an operation for vesical calculus.

The methods of operating are by perineal, lateral and median lithotomy, by suprapubic cystotomy and colpocystotomy.

Suprapubic cystotomy is the operation of choice. It is performed for calculi of large size; for encapsulated or adherent calculi; for calculi situated in the mouth of the ureter in the bladder wall; for calculi that are retained in a postprostatic pouch in prostatic hypertrophy; or in cases in which a tumor is present. The operation consists in the ordinary suprapubic incision, exploration of the bladder and removal of the stone.

Perineal lithotomy is advisable in the case of calculi that are too large to pass through the urethra; in patients of an advanced age, where there is marked arteriosclerosis; in the presence of a chronic suppuration of the urinary tract; or where there is a large amount of fat on the abdomen.

Lateral perineal lithotomy has been altogether abandoned, the operation of choice being the median incision.

Colpocystotomy is an operation sometimes resorted to in the treatment of vesical calculus in women. I do not consider it a good surgical procedure, and, as far as I can ascertain by looking over the histories of a hospital that I have been connected with for fifteen years, but one such operation has been performed during this time. It simply means an incision of the anterior wall of the vagina and the bladder, with the removal of the stone. In such an operation, there is always danger of injuring the ureters and of a persistent vesico-vaginal fistula.

In conclusion, I will say in comparing the relative value of the different operations for vesical calculus, that in young children litholapaxy is a difficult procedure, as the calculi found at this age are generally oxalic and very hard, while the urethra is too small for the admission of a lithotrite. Consequently a suprapubic or perineal lithotomy is preferable.

In women, removal of the calculus after urethral dilatation is indicated if the stone is small; if too large, crushing of the calculus and removal of the fragments with forceps or through an evacuator. If I were to choose between removing a calculus in women by a suprapubic cystotomy or by a colpocystotomy, I would elect the former. In men, litholapaxy is preferable, as it is the least dangerous to the patient. I do not employ this method, for I do not feel that I am in sufficiently good practice to undertake the operation, as I have so few cases of the kind.

My method is, then, to determine my operative procedure by the appearance of the calculus on cystoscopic examination. If it is of a size which seems easy to withdraw through a perineal incision, I operate by a median perineal lithotomy. Rough calculi of two thirds of an inch in the largest diameter can be easily removed in this way, after dilating thoroughly the prostatic urethra; while smooth stones three quarters of an inch in diameter can be withdrawn in the same manner. The largest stone that I have ever removed through the perineal incision measured seven eighths of an inch in its largest diameter. This calculus was smooth, there was no injury done to the prostatic urethra and the wound healed quickly. With patients in whom calculi over three fourths of an inch in diameter are present, the suprapubic operation should always be performed.

# CHAPTER XLIII

## TUBERCULOSIS OF THE BLADDER

Vesical tuberculosis is the result of a tuberculous infection of the bladder, with the development of tuberculous lesions. It may remain for some time as a purely tuberculous involvement; but generally, at an early period of the disease, a secondary infection takes place through the entrance into the bladder of pus-producing germs, and a tuberculous cystitis develops.

**Etiology.**—Vesical tuberculosis probably never occurs primarily in the bladder, but is secondary to the disease somewhere else in the body, almost always in some other part of the genito-urinary tract, the kidney, prostate or epididymis, but especially the kidney. It is probable that not over one per cent of the cases of genito-urinary tuberculosis occur primarily in the bladder. When secondary to renal tuberculosis, the disease extends down the ureters, whereas, when secondary to tuberculosis of the prostate, it extends directly through the tissues. As an associated involvement, tuberculosis of the bladder occurs in about seventy-five per cent of all cases of genito-urinary tuberculosis. The disease is much more frequent in the male than in the female, in the proportion of two to one. It generally occurs in early and middle life, between the ages of fifteen and thirty-five. It has been observed, however, in children four and five years of age, and is probably much more frequent in early life than is generally supposed.

The predisposing causes of vesical tuberculosis are traumatism, obstruction and interference. Presumably none of these causes is necessary, as tuberculosis in the bladder often takes place without them. I have noticed, occasionally, that in cases of renal tuberculosis the bladder has been free from involvement until after a cystoscopic examination, and I believe that instrumentation in the bladder, when renal or prostatic tuberculosis is present, gives rise to traumatism that is sufficient to act as a predisposing cause of vesical tuberculosis, whereas it would not have this effect in case the kidney and prostate were healthy. I believe, also, that a congenital stricture at or near the external meatus is a predisposing cause on account of the extra strain to which the bladder is subjected in forcing urine through the narrowing. I have seen the most distressing cases of vesical tuberculosis in patients with these strictures who have never had any urethral disease. Also, I believe that an acquired stricture due

to a urethritis is a predisposing cause and that any bulging of the prostate into the urethra in the case of tuberculosis, or any disease causing an obstruction, also predisposes to tuberculosis of the bladder.

There are certain other troubles that are considered predisposing factors, among which is gonorrhea, but, as this infection is so frequent, it is difficult to say whether bladder tuberculosis in a patient suffering from this trouble has any connection with it or not. Walker states that, of 135 cases, 71 had had this disease, and I have had patients in whom both gonococci and tubercle bacilli were found in the urine. Once a tuberculosis of the bladder has developed, however, gonorrhea would be a sufficient cause for the development of a tuberculous cystitis, in which case the pus-producing germs would probably be other than gonococci.

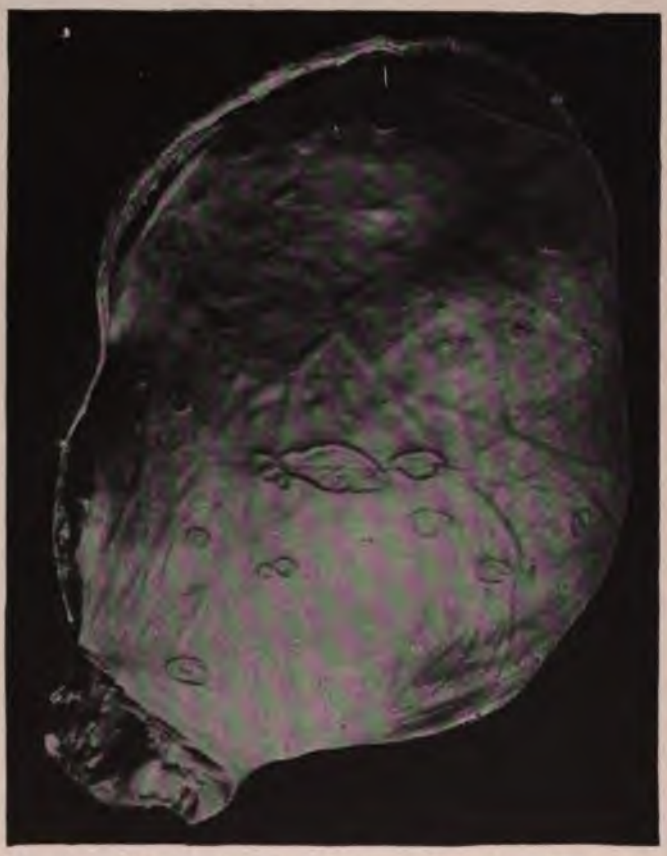

FIG. 459. — VESICAL TUBERCULOSIS WITH RING-LIKE SUPERFICIAL ULCERATIONS. (From Taylor.)

Vesical interference due to any condition outside of the bladder that interferes with its function through traction or pressure predisposes to bladder tuberculosis. Among the outside causes are displacements of the uterus; pressure from fibroid tumors or exudates; or from a displaced, loaded and adherent sigmoid; adhesions to the Fallopian tubes, the intestines or the omentum. Another predisposing cause consists in cystocele associated with retention of urine.

Again, an existing cystitis referable to any predisposing cause or any variety of pus-producing germs would in itself be a favorable soil for tuberculous infection, although it is probable that the cystitis would not become tuberculous unless tuberculosis exists elsewhere in the genito-urinary tract.

The active cause in all cases, whether in aseptic or septic bladders, is in-

fection with the tubercle bacillus. This infection is often secondary to that of the genital tract, although generally descending from the kidney. At autopsy, it is often impossible to determine whether the disease attacked first the bladder or the kidney. Clinically, it is also a difficult question when the patient first comes under observation, for the symptoms of urinary tuberculosis are more common in the bladder than elsewhere. Even when the disease is very marked in the kidney, and but slightly so in the bladder, the clinical symptoms point only to vesical involvement. It has been estimated by different statisticians, however, that anywhere from fifty to ninety-five per cent of cases of tuberculosis of the bladder are secondary to that of the kidney.

The infection with tubercle bacilli usually reaches the bladder through the kidney, sometimes by way of the blood. The following methods of infection are possible in the presence of tubercle bacilli in the body: Infection through the blood current; by way of the lymph channels; by excretion of tubercle bacilli through the kidneys, with or without disease of these organs. Again, in case tubercle bacilli are absent from the body, they may be introduced by cohabitation, or through catheterization.

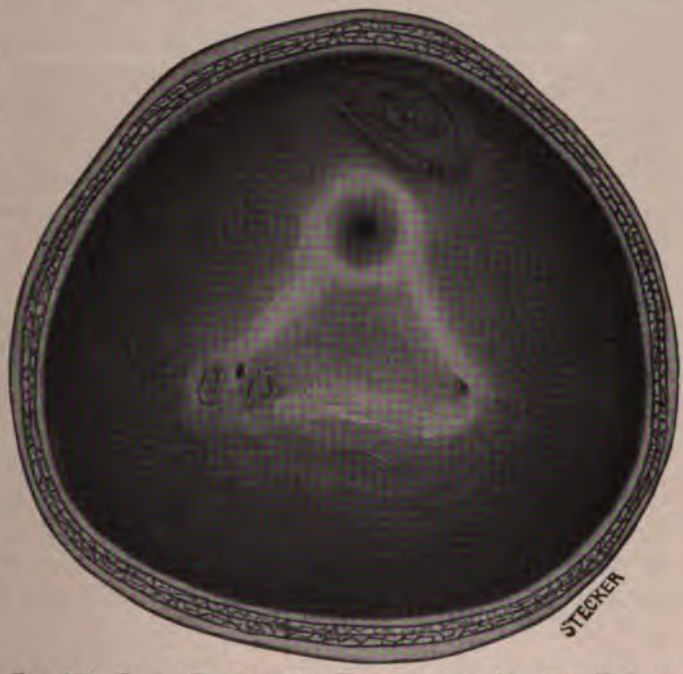


Fig. 460.—Large Tuberculous Ulcer on the Anterior Wall of the Bladder near the Sphincter Muscle, and Two Small Ulcers near the Left Ureter. (Author's case.)

**Pathology.**—Tuberculosis of the bladder generally shows itself first by the presence of small, yellowish-gray miliary tubercles situated on the surface of the mucous membrane that may be surrounded by a pink zone of congestion. They are generally seen on the trigone near the mouth of one of the ureters (Fig. 460). These may break down, giving rise to small irregular ulcerations, around the edges of which are more miliary tubercles. These ulcers are very characteristic, for at the beginning they are not deep and resemble an erosion with thinly elevated edges (Fig. 459), so that they might be compared to a flat tray with a very low rim. Later on they may become deeper and more infiltrated; the

whole inner wall of the bladder may be involved and a considerable portion of it destroyed. The ulcerations are either single (Fig. 460) or multiple. Ecchymoses may be scattered over the surface of the bladder and fine granulations may also be seen in areas. The inflammation may extend to the outer wall of the bladder, giving rise to a pericystitis and contraction of the organ. Much fibrolipomatous tissue is often present (Fig. 461). The tubercular lesions are situated in about a third of the cases on the trigone and in about a third more near the orifices of the ureters. Ulceration is not frequent on the remainder of the base of the bladder, nor on the posterior or superior wall. I have, however, seen very typical ulcers of varying sizes on the anterior wall, and also at the neck of the bladder. Deep ulcerations usually do not occur, although they are mentioned by some observers as giving rise to perforation of the bladder and the formation of a fistula; but such complications are extremely rare.

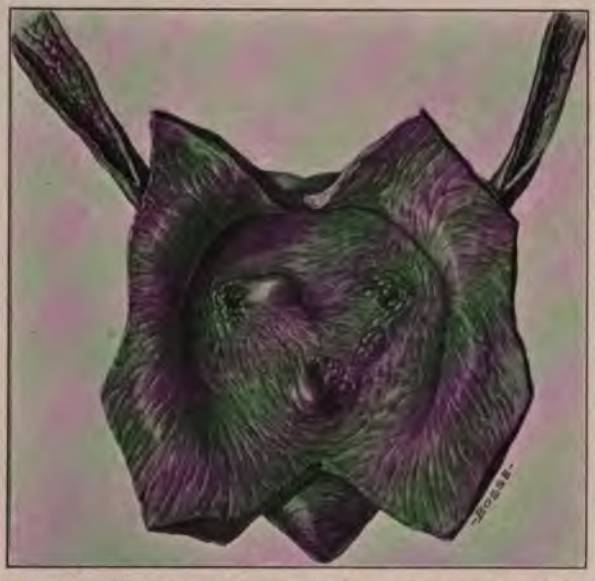

Fig. 461.—The Bladder of a Case of Tuberculous Cystitis of Long Standing. Showing tubercular thickenings in both ureters, tuberculous deposits and scar tissue about the mouth of the right ureter, and the mouth of the urethra, and tuberculous deposits extending from the urethra up to and about the left ureter.

**Symptoms and Diagnosis.**—The principal symptoms of tuberculosis of the bladder are: Frequent urination, pain and tenesmus. Hematuria is also a common symptom. Occasionally, there may be but slight frequency and no pain or hematuria, unless the blood comes from the kidney. A mild grade of symptoms occurs when the tubercles in the bladder are situated at some distance from the urethral orifice, and when the bladder and the kidney are not secondarily infected by pus-producing germs. In the vast majority of cases, the symptoms of frequent urination and pain are always present in a more or less marked degree, depending on the location of the lesion. A small ulceration over the vesical sphincter will give rise to more frequency and distress than occur when the walls of the entire upper hemisphere of the bladder are filled with ulcerations. Generally the advent of cystitis due to secondary infection with pus-producing germs increases the pain and vesical irritability. The frequency of urination varies in different individuals, but in the average case

the patient urinates twelve times in the course of the day, and six times at night. In a case where the tuberculous lesions are situated near the urethral orifice, the frequency may be as great as every half hour, night and day, or even every quarter of an hour in exceptional cases. Patients usually exaggerate their symptoms and in their history state that they urinate every ten or fifteen minutes day and night, while at the same time they will have come from their houses, half an hour distant, and will have talked another half hour without urinating. Some patients do suffer greatly and spend most of their time seated in the lavatory or with a urine duct beside them. The symptoms of frequency of urination and tenesmus sometimes occur so suddenly after an attack of pain in the loin as to resemble the passage of a renal calculus down the ureter into the bladder, although it is simply due to the breaking down of a tubercle into an ulcer at the vesical sphincter.

The pain is generally situated above the pubes, deep in the perineum in a position corresponding to the neck of the bladder, or at the junction of the corpora cavernosa and the glans penis. When the bladder begins to fill with urine, the pain is suprapubic, due to the distention; when the patient is voiding urine, it is in the glans; but when the patient finishes urinating, it is in the neck of the bladder, accompanied by a most marked cramp or tenesmus, and a feeling that there is some more urine left that cannot be expelled. A burning, scalding sensation is also present at this time.

Hematuria occurs in from fifteen to twenty per cent of the cases. It may come from the bladder or from the kidney. The bleeding is spontaneous and has no connection with exercise or movement. Vesical hematuria is not profuse, as the urine is usually but slightly reddened by the blood, and small clots may be passed, whereas the worst part of the hemorrhage may be terminal, due to the spasmodic contraction and squeezing of the inflamed mucous membrane at the end of the act of micturition.

In some cases, the hemorrhage may be continuous, the urine always having a pinkish tinge. Under these conditions, either the blood comes from the kidney or there is a marked cystitis with considerable ulceration in the bladder. The urine is passed with great frequency and its color is modified by the presence of pus and blood. These cases were formerly spoken of as hemorrhagic cystitis and contracted bladder. I am satisfied, however, that such a form of hemorrhagic cystitis, so-called, is generally due to tuberculosis.

Urinary Findings.—The urine in cases of vesical tuberculosis may be clear or cloudy, depending on the presence or absence of pus. The color is that of water, yellow or amber; or pink or red, if there is an admixture of blood. In the presence of renal tuberculosis, the urine may resemble starch water. The specific gravity varies, being low in polyuria from an associated tubercular nephritis; otherwise about 1.020. I have seen it less than 1.001 in acute renovesical tuberculosis. Albumin is present principally in the form of nuclein.

Blood corpuscles are generally found, especially after a secondary infection. Pus is absent or present in large quantities, depending on the presence or absence of a secondary infection. Epithelial cells from the bladder are found, also from the kidney, if this organ is involved. Casts are often present, due to renal involvement: Hyaline, fine or coarse granular, epithelial, pus or mixed, depending on whether or not a suppurative process exists in the kidney. The amount of urea is, as a rule, diminished, due to renal involvement. The diagnosis of reno-vesical tuberculosis from the urinary examination of a specimen sent to the laboratory is generally cystitis, pyelitis and interstitial nephritis. The diagnosis of interstitial nephritis is based on the large amount of urine of a low specific gravity with a trace of albumin and a few hyaline casts, together with inability to find the tubercle bacillus.

The demonstration of tubercle bacilli proves the presence of tuberculosis, although they may come from the kidney, as the process is usually more advanced there than in the bladder, notwithstanding the fact that all the symptoms may be present in the latter organ. It may be said, however, that tubercle bacilli in the urine, associated with vesical epithelia, point to bladder tuberculosis; and, when associated with kidney products, to renal tuberculosis. The tubercle bacilli are not easy to find and therefore, in doing work in tuberculosis of the urinary organs, it is advisable to have a number of guinea pigs and inoculate the urine from each patient into these animals, as frequently considerable time is wasted in examining urine and the patient becomes dissatisfied and feels that the physician is not able to diagnosticate his case.

Cystoscopic examination is very important in the diagnosis of tuberculosis of the bladder. When the organ is fairly tolerant and will hold from two and a half to five ounces of fluid and can be washed clean, we can usually make a satisfactory examination; but when it bleeds easily and will not tolerate more than an ounce and a half to two ounces, such an examination is unsatisfactory, even if we use cocain to dull the sensibility and adrenalin to stop the hemorrhage. It is very difficult to make a satisfactory examination of the bladder if adrenalin is used, as the tissues are blanched and the superficial ulcerations and areas of congestion lose their typical appearance. If the bladder is fairly tolerant and holds three ounces or more of fluid, it is sometimes impossible to make a good examination, if the kidneys are much involved and pus is constantly coming down the ureter and obscuring the field of vision. I have had a great deal of experience in examining tuberculous bladders and frequently it has taken me over an hour to examine a bladder under ether anesthesia; for a tuberculous bladder will often not relax, even when sufficient ether has been administered to produce the degree of anesthesia necessary to perform any surgical operations. The anesthetists have told me in these cases that, to relax the bladder wall thoroughly, it would require such a profound degree of anesthesia that the patient's life would be endangered. When we obtain a suffi-

ciently good view of the interior of the bladder, we generally see masses of tubercles or small ulcerations on the trigone and about the mouth of one ureter. This is usually sufficient to convince me that the kidney on that side is tuberculous and in almost every instance it has been proven in my work. In olden days, before the refinements of ureteral catheterization and the custom of inoculating guinea pigs had been established, it was quite a reliable guide, and, if it corresponded with my chemical findings, I felt justified in making a lumbar incision and examining the kidney and operating if it appeared to be diseased. We may also see, in and about the bladder base, small groups of tubercles and small ulcerations; but if we sweep our cystoscope about the neck of the bladder, in such a way as to have a view of the bladder opening, we may see ulcers of various types. Of the superficial ulcer I have already spoken in the pathological chapter. It looks, with the cystoscope, like an erosion of the skin after the epidermis has been scraped off by a piece of glass or sharp knife and a little serum has begun to exude, excepting that there is a very thin and slightly elevated peripheral thickening. It may also at times be compared with a mucous patch in the mouth that is but slightly infiltrated and has a well-defined border. At other times, little fissures are seen extending into the urethra, or, in old cases, thick and deep ulcerations covered with pus. A thorough examination of the patient should also be made. If the patient is found to have lost considerable weight and strength and to have less appetite than usual, it points to tuberculous infection. Night sweats and elevation of temperature at some time during the day, even of a slight degree, would strengthen our suspicion of this trouble. An examination of the lungs should also be made, to see if there are any evidences of the disease situated there.

The genital apparatus should be examined, especially the epididymis and the prostate and, if evidence of disease is found in these organs, it points to this trouble. The presence of enlarged glands, or scars in the region of the glands or joints, also points to the disease.

**Differentiation.**—In the differential diagnosis, calculus, tumor, obstruction and paralysis should be considered. In stone, the symptoms of frequent urination and pain are marked during the day but slight during the night; in tuberculosis, they are practically the same both day and night. In stone, radiography will generally show a shadow; in tuberculosis, there is no shadow, but the urine and guinea-pig inoculation may give evidence of the disease.

In tumor of the bladder, there is also a cachexia, but it does not develop as rapidly as in tuberculosis. Constitutional symptoms of an acute character are not so prominent. Pain and frequency of urination are less marked. The hematuria is more profuse, and fragments of tumor tissue or atypical cells are found in the urine, whereas tubercle bacilli are absent.

The obstructions that give rise to urinary symptoms resembling those of vesical tuberculosis are stricture and enlarged prostate. Stricture is generally

the first condition that is thought of when a physician is called to see a patient with beginning tuberculosis of the bladder, especially in the case of patients who have suffered from urethritis. The instruments passed into the bladder with the object of examining and treating the patient often aggravate the trouble. In the presence of a stricture, the frequency of urination and pain is not usually so marked during the night as in tuberculosis, and the hematuria is not so frequent. No tubercle bacilli are found in the urine, but the urethra is found to be narrowed in places.

Prostatic hypertrophy is spoken of as a disease resembling tuberculosis of the bladder. It is extremely rare, however, to find vesical tuberculosis in a patient fifty-five years of age or older. Moreover, in hypertrophy of the prostate, frequency of urination is much less marked during the day than in vesical tuberculosis, and is also less troublesome during the night. An enlarged prostate can be felt, residual urine is present, but no tubercle bacilli can be demonstrated.

Gonorrheal cystitis may be mistaken for a tuberculous infection, or the former may be a predisposing cause of tuberculous cystitis. Inflammation of the bladder due to the gonococcus is rare, of shorter duration and not so painful as vesical tuberculosis. It may be said that, in the absence of all other causes pointing to involvement of the bladder, the condition is usually tuberculous, and if so, cystoscopy will confirm the diagnosis.

**Treatment.**—The treatment of tuberculosis of the bladder has already been considered in the chapter on Renal Tuberculosis, and in that on Cystitis, but I shall briefly refer to it again. When we are studying a case of vesical tuberculosis, before the tubercle bacilli have been found, the patient should be treated symptomatically, and if we think from our cystoscopic findings that the trouble is tuberculous, the same treatment should be given as if the diagnosis had been already confirmed by the discovery of the tubercle bacilli in the urine, or by guinea-pig inoculation.

The essential features of the treatment are rest, a proper diet, suitable clothing, fresh air and medication. The patient should at all times be comfortable and free from worry. In very acute cases a rubber urinal should be worn during the day, strapped to the leg, and a glass urinal should be kept in the bed during the night. The ease and relief obtained in this way do much toward helping the improvement and peace of mind of the patient.

As little time as possible should be devoted to business. The patient should rest at home evenings and on damp, disagreeable days, lying about on a couch or reclining in a comfortable chair. On pleasant sunny days, he should remain out of doors as much as possible, for fresh air and sunshine are of as great importance in this disease as in tuberculosis elsewhere in the body. Exposure to draughts of air should be avoided at all times. The body should be kept warm, special attention being given to the legs and feet. Woolen socks and underclothing are the most suitable for walking about in the open air, and care must

be taken not to perspire and then sit about in sweat-soaked garments, but to return home immediately and change the clothing.

The diet in tuberculosis of the bladder should be simple but nourishing, and forced feeding should be avoided. It should consist of cereals, eggs, fish, meat and green vegetables, in moderate amounts. In fact, it may be said that a simple diet, excluding fried foods and sweets, is indicated. Naturally, all condiments such as pepper and spices should be avoided; and also alcoholics, except light wines mixed with water.

MEDICATION.—I am in the habit of prescribing 3 grains of carbonate of creosote three times a day in all my cases of genito-urinary tuberculosis; also 15 minims of the sirup of the iodid of iron, mixed with equal parts of the sirup of bitter orange peel, in milk or water, between meals. When cystitis is present, I give some urinary antiseptic, usually urotropin, as it is eliminated in the urine as formalin, making an antiseptic wash for the bladder. Sodium benzoate is also given at times, as well as salol. In fact, I think it is better to change urinary antiseptics from time to time, rather than continue too long the use of a single remedy.

For the control of the most distressing symptoms of renal tuberculosis—pain and tenesmus—antispasmodics are indicated. The mixture that I usually give in these cases is one composed of tincture of belladonna and sodium benzoate, called the "B. and B. Mixture":

℞ Tincturæ belladonnæ ..... ʒijss;
Sodii benzoatis ..... ʒiv;
Aquæ destillatæ .....q. s. ad. ℥ij.

M. et sig.: ʒj t.i.d. in a glass of water between meals.

If this does not relieve the pain, I add codein in a sufficient amount to have ¼ of a grain in each dose. In many cases this affords absolutely no relief, nor do any of the other remedies recommended for such conditions, and I then give a mixture of morphin and bromid of potash.

In certain other cases in which this has not been as efficient as I would like to have it, I add 7½ grains of chloral hydrate to the dose. At first I gave this mixture of morphin, chloral and bromid with some apprehension when the kidneys were involved; but the urine examination showed no ill effects upon the kidney and the patients obtained more relief than by any other remedy.

℞ Codeinæ sulphatis ..... grs. iv;
Chloral hydrate ..... ʒij;
Sodii bromidi ..... ʒiv;
Aquæ menthæ piper. .....q. s. ad. ℥ij.

M. et sig.: ʒj every four hours in water.

In some cases morphin is employed instead of codein.

Local Treatment.—Local treatment is also of value in the management of this disease. Boric-acid solution, in a strength of four per cent, makes a good cleansing wash for the bladder. Bichlorid of mercury (1:10,000 solution) given by instillation or injections of from half a drachm to one ounce through the catheter is much employed in France, but does not seem to act equally well in bladders in America. Nitrate-of-silver solution, in a strength of from 1:8,000 to 1:1,000, is not well tolerated by the bladder, but if the vesical cavity is first washed out with a silver solution by means of a catheter, and after it has been emptied, a solution of argyrol, ten to twenty-five per cent in strength, is injected through the catheter, the patient is enabled to tolerate a silver-nitrate solution of from 1:2,000 to 1:1,000. I have absolutely cured in this way vesical tuberculosis with ulcerations after having cut any obstructions that were found in the urethra.

Another valuable remedy in this disease is gomenol. Cases of tuberculous cystitis have been remarkably benefited by injecting 10 c.c. of fifty-per-cent gomenol oil into the empty bladder, every day for two weeks, then every other day, allowing it to remain. Iodoform emulsion, two per cent in strength, is also of value, used in the same manner. For further consideration of this subject, the reader is referred to the chapter on Tuberculosis of the Kidney, and to the chapter on Cystitis.

Operative Treatment.—Both suprapubic and perineal cystotomies are performed for drainage in these cases. I am strongly opposed to these operative procedures, and believe that ninety-five per cent of the patients are not helped by this means, but that on the contrary their trouble is made worse, and annoying fistulas frequently follow. I believe, however, that it is extremely important to examine the urethra of male patients, and, if narrowings are found, to enlarge them to the size of the remainder of the canal. In female patients, any interference with the bladder function, such as a displaced uterus or adhesions to the bladder or pressure from tumors, should be corrected by operation.

# CHAPTER XLIV

## BLADDER DISTURBANCES DUE TO EXTRAVESICAL CAUSES

**Etiology.**—The bladder is so situated in the pelvic cavity that it comes in contact with certain organs and tissues, either in an abnormal position or in a diseased condition, which interfere with its function. These organs and tissues are in men: The rectum, prostate and seminal vesicles; in women: The uterus, the tubes and ovaries; while, in both sexes, the large and small intestines, the appendix and the omentum may interfere with the bladder under certain circumstances. Besides this, there are certain tumors, cysts and inflammations occurring in these organs and tissues that also have an effect on the bladder.

These neighboring organs and tissues either through contact, in case they are displaced, or through adhesions, when they are inflamed, so pull, push or press upon the bladder, as to cause certain functional disturbances which are made known by various urinary symptoms. They also cause a congestion of the bladder predisposing to a cystitis.

These bladder disturbances due to extravesical causes are much more common in women, whereas the intravesical causes are more common in men.

**Symptoms.**—The symptoms of these bladder disturbances are frequency of urination, pain, tenesmus, difficulty in micturition, retention and incontinence.

These symptoms do not yield to local treatment, and when the exact cause is not known, they are often said to be due to neurosis or neurasthenia. They are, however, generally cured by an operation, when once the correct diagnosis has been made. As my experience in the treatment of pelvic diseases in women has been in cases in which the bladder symptoms have been marked, I have approached this field as a urologist rather than a gynecologist and consequently this chapter will consider bladder conditions in women from a urological point of view.

**Varieties.**—I. Uterine Displacements.—I will first consider the disturbances of the bladder of which the uterine displacements are the causative factor.

All anterior and posterior displacements of the uterus affect the bladder to a greater or less degree. The anterior displacements are usually either anteversions or anteflexions. In the case of *anteflexions,* the uterine fundus is about

in its normal position, the cervix being bent upon it rather than the fundus bent upon the cervix (Bovée). The bladder disturbance is caused by the rigidity of the uterine tissue at the angle of flexion. This interferes with the moving upward of the dilating bladder as it fills with urine and thus gives rise to a feeling of vesical pressure earlier than usual and a consequent desire to urinate more frequently. The weight of the fundus on the bladder also interferes somewhat with the dilatation (Fig. 462).

In *anteversion*, the bladder function is interfered with, not only by the pressure of the fundus of the uterus on the roof of the bladder, but also by the

FIG. 462.—ANTERIOR FLEXION OF THE UTERUS. (Dudley.)

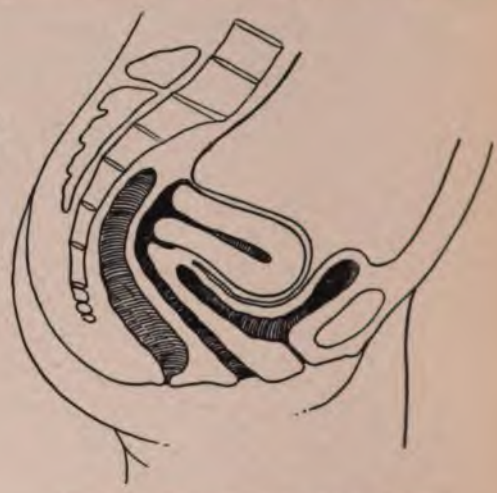

FIG. 463.—ANTEVERSION OF THE UTERUS. (Dudley.)

cervix tilting upward and backward and thus pulling on the vesical base (Fig. 463).

This gives rise to the same symptoms as anteflexion.

These uterine displacements do not actually displace the bladder, but rather interfere with the filling of the organ and therefore the patient feels the desire to urinate at more frequent intervals, besides a bladder discomfort.

*Retroversions* and retroflexions are less liable to cause bladder disturbances than are the anterior displacements. A large retroverted uterus may, however, give rise to marked urinary disturbances when the cervix presses against the neck of the bladder, or the urethra near the neck, to such a degree that there may be great frequency of urination and tenesmus, or even retention or incontinence. The dragging of the displaced uterus on the bladder also assists in causing this disturbance (Fig. 464).

In *retroflexion*, the bladder symptoms are not marked, as, barring some pulling on the bladder by the tilting upward and backward of the anterior uterine wall to which it is attached, there is nothing to cause its disturbance (Fig. 465).

Displacement of the uterus backward *during pregnancy* is quite a frequent occurrence. This gives rise to very disagreeable bladder symptoms, such as dysuria and retention, owing to stretching of the bladder and pressure on the urethra.

The displacements of the bladder will now be considered that are associated with changes in the position of the uterus, which in turn are dependent upon other pathological conditions.

After this, the influences on the bladder of pathological changes in the different organs and viscera in the lower abdomen and pelvis will be demonstrated and illustrative cases shown.

The bladder is displaced (1) forward, (2) backward, (3) laterally, (4) downward and (5) upward.

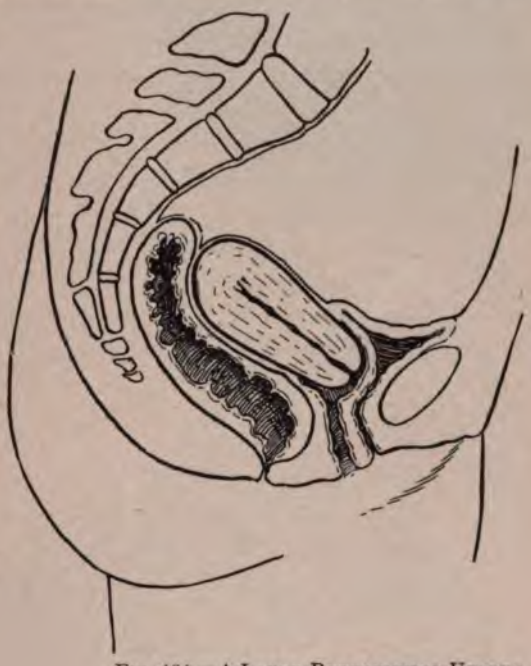

Fig. 464.—A Large Retroverted Uterus.

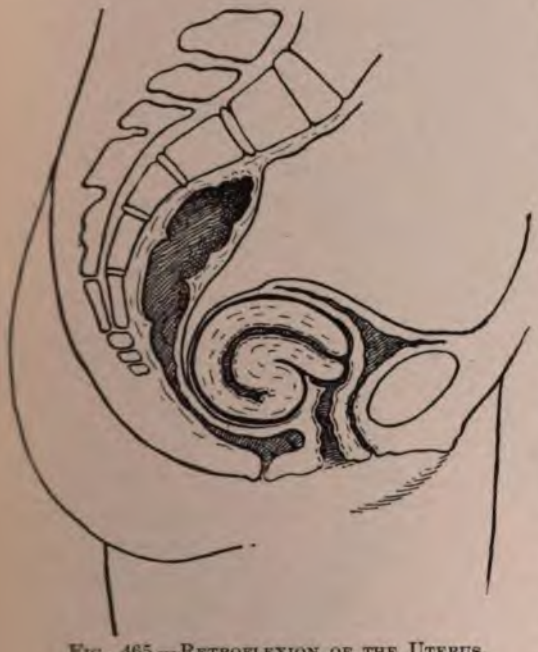

Fig. 465.—Retroflexion of the Uterus. (After Dudley.)

(1) *The Displacement of the Bladder Forward.*—Marked displacement of the bladder forward is not due to anteversions or anteflexions, although the anterior portion of the bladder may be pressed against the pubes by the fundus of a large anteverted uterus.

An entire uterus is, however, sometimes pushed forward against the bladder so as to crowd it against the pubes and the abdominal wall. The uterus, in such a case, has been pushed forward by a pelvic hematocele, or by a pelvic exudate resulting from metritis (see Fig. 481), or by a pelvic abscess following appendicitis. (See Fig. 488.) In such cases, the uterus may be held in its new

position by adhesions after the trouble has subsided and still keep up the pressure on the bladder (Fig. 482). A Fallopian tube may also, through its adhesions, hold the uterus forward against the bladder so as to interfere with its function (Fig. 483).

A prolapsing uterus in its descent also presses the bladder forward. (See Figs. 466, 467, 468, 469 and 470.)

Uterine fibroids are another cause of anterior displacement of the uterus, as, in addition to carrying the bladder upward, they also tend to press it forward against the pubes, often giving rise to retention of urine above this point (Figs. 471 and 472).

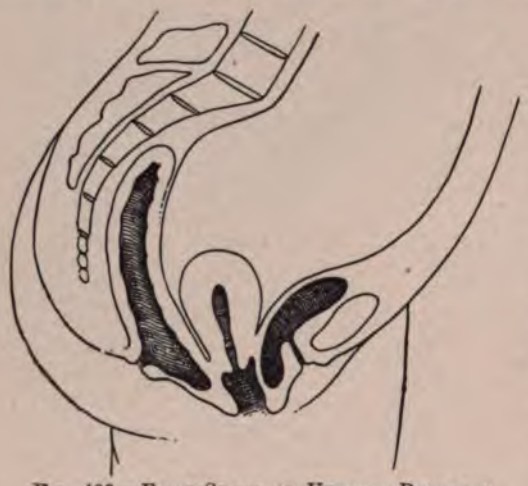

FIG. 466.—FIRST STAGE OF UTERINE PROLAPSE. (After Dudley.)

(2) *Displacements of the Bladder Backward.*—The entire uterus is sometimes pushed back toward the sacrum in such a way as to stretch out the bladder and the anterior vaginal wall. This pushing of the uterus back is caused by a pelvic exudate forming between the layers of the broad ligament due to a metritis. The exudate flattens or mushrooms the bladder on the vaginal wall and pelvic floor and gives rise to dysuria and frequently retention (Fig. 478).

(3) *Lateral Displacements of the Bladder.*—Lateral displacements of the bladder may also occur, due to its becoming attached to an inflamed Fallopian

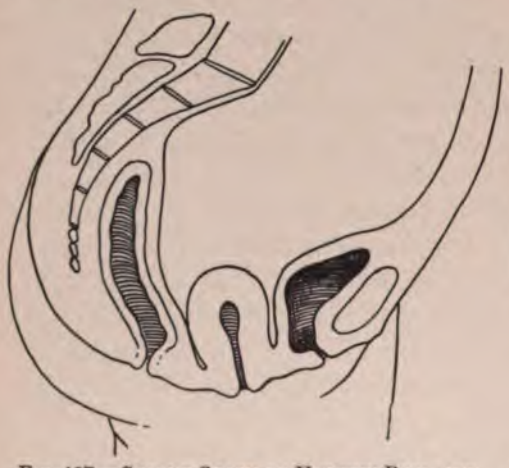

FIG. 467.—SECOND STAGE OF UTERINE PROLAPSE. (After Dudley.)

FIG. 468.—THIRD STAGE OF UTERINE PROLAPSE. (After Dudley.)

tube and being drawn to one side of the uterus and held there. The bladder in filling turns around the uterus and its function is interfered with (Fig. 484).

The bladder is displaced to one side also by a hernia which pulls it toward or through the inguinal or crural canal (Figs. 431 and 432).

The bladder has also been drawn out of the pelvis and across the lower abdomen by an inflamed appendix (Fig. 490).

(4) *Downward Displacement of the Bladder.*—Downward displacement of the bladder is usually due to a prolapse of the uterus, which in turn depends on a tear in the pelvic floor and laxity of the uterine ligaments. There are three stages of uterine prolapse: First, down and back, when there is a slight cystocele; second, when the uterus is in the vagina and extends down to the vulva, in which case there is a more marked cystocele and residual urine; and third, when the organ protrudes beyond the vulva. In the third stage, the cystocele is more marked and there is more retention of urine and often incontinence, as seen in Dudley (Figs. 466, 467, 468).

Fig. 469, from Burkhardt, illustrates the cystocele and the position of the ureter in a case of prolapse of the third degree. The bladder is trabeculated and the ureter is seen to point backward.

Fig. 469.—Cystocele Showing Position of Ureteral Orifice (*U*). The cystocele is beautifully marked. (From Burkhardt.)

The accompanying illustrative case of prolapse of the uterus in a City Hospital patient was more marked than usual. The patient was sixty years old and had retention and incontinence during the day, whereas at night she urinated from three to five times, besides leaking urine slowly between times. In this case, the uterus was so bound down to the pelvic floor by adhesions, probably due to a salpingitis years before, that it could not be replaced in the pelvis and at operation it could not be restored to a satisfactory position, although the

best possible anterior fixation was made. Immediately before the operation the patient was catheterized, but it was found that about 14 ounces of urine was still present in the portion of the bladder that had fallen back over the uterus, and it had to be withdrawn by a catheter. The bladder was divided into two parts by being pressed against the pubes. The prolapsed portion below the compression and the displaced portion above it are shown in Fig. 470.

FIG. 470.—UTERINE PROLAPSE. Notice the retention of urine in this case. (Author's City Hospital case.)

(5) *Displacement of the Bladder Upward.*—This may be due to fibroid tumors of the uterus (Figs. 471 and 472), and to the pulling up of the bladder by omental adhesions. (See Fig. 491.)

During pregnancy, the bladder is subjected to many varieties of treatment by the uterus. During the early period, the growing uterus interferes mechanically with the bladder, thus causing irritability, and, as it continues

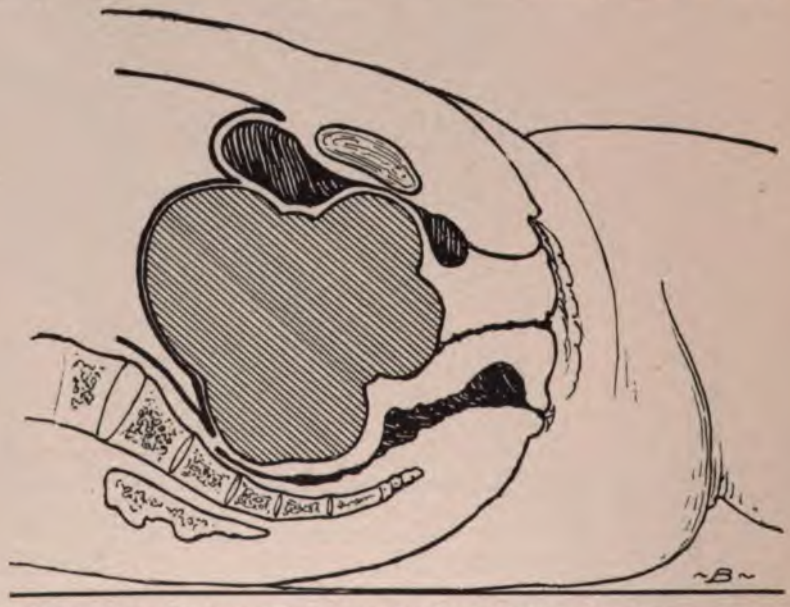

FIG. 471.—EFFECT OF THE UTERINE FIBROID ON THE BLADDER WHEN THE PATIENT IS LYING DOWN. It presses the bladder against the pubes. (Author's case.)

to grow in an anteflexed position, its weight on the bladder necessitates frequent urination. After the uterus has risen above the pelvic brim, the bladder disturbance ceases; but shortly before labor, when the descent begins, the pressure on the bladder is resumed and frequency reappears (Fig. 473). After delivery there may be retention for a day or two.

II. Pelvic Tumors; Cysts.—Pelvic tumors usually arise from the uterus or its appendages and cause a disturbance of the bladder, either in a mechanical way, or by directly invading the bladder wall by continuity. There are cases in which the vesical function is not impaired, in spite of considerable displacement and change in form of the organ.

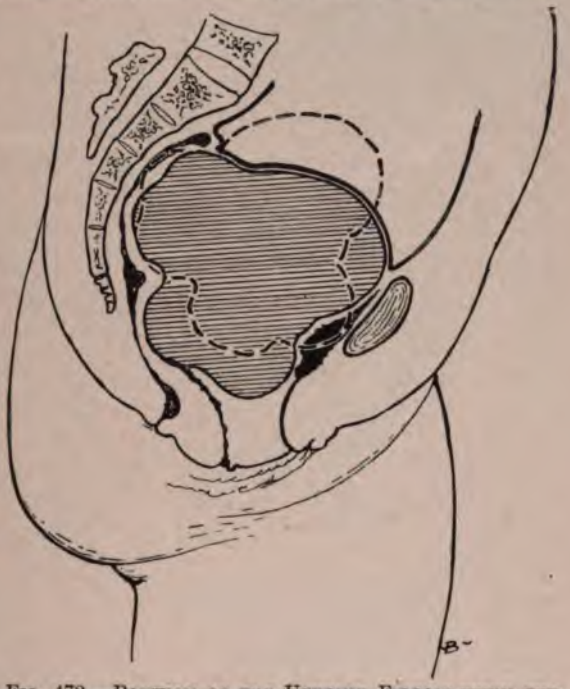

Fig. 472.—Position of the Uterine Fibroid when the Patient is Standing. The same case as Fig. 471. The point of obstruction seen in dotted lines falls away from the pubes and liberates the bladder.

*Fibroid tumors* of the uterus are more frequently than any others the cause of vesical disturbances, the symptoms of which are a bearing-down feeling, frequency of urination, dysuria, retention or incontinence in cases in which they displace the bladder. Vesical symptoms, due to the displacement, are greatly exaggerated if a myoma is present, particularly if the latter is imbedded in the angle of the cervix. When a large uterine fibroid, including both the cervix and fundus, has filled the pelvis and grows out of its cavity, the entire bladder may be carried upward, become flattened out over the anterior face of the tumor mass and reach perhaps to the level of the umbilicus, as has already been mentioned under Ascent of the Bladder. Elevation of the bladder to a lesser degree may also result from a deep-seated myoma of smaller size, but the clinical picture depends on whether the tumor presses against the bladder itself or against the urethra. The function may not be impaired in the first instance, but, in case the fibroid presses against the urethra, partial or complete obstruction of the canal may result, causing retention of urine and later perhaps renal involvement (Figs. 471 and 472). An illustrative case of mine in private practice gave a beautiful example of the mechanical action of a myomatous uterus.

Married woman, aged forty, married sixteen years, one child. For past two years had excessive flowing and interrupted sleep, which weakened her considerably. The patient had difficulty in urination on account of an obstruction by a tumor which could be felt above the pubes when she was lying down, but which fell away from it when she stood up. She could urinate only when standing; urinated five or six times a day and two or three times at night. The fibroid uterus appeared to be the size of two fists. It pressed upon the bladder to the left and lifted it three and one half inches above the pubes, interfering with its function. Urine negative.

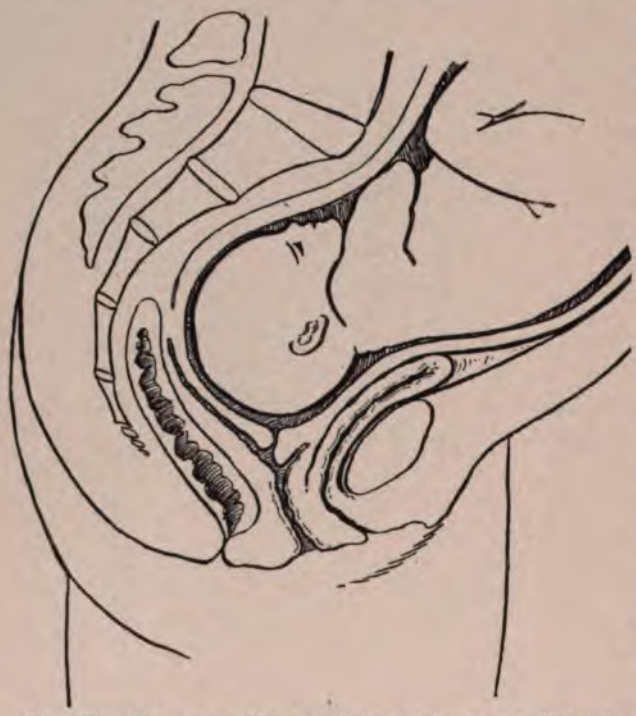

Fig. 473.—Effect of Uterine Pregnancy on the Bladder.

Operation: Hysterectomy. Immediately before the operation, the patient was catheterized, but further examination showed fluid still in the bladder. A catheter was passed again as far as possible and twelve ounces of urine withdrawn, notwithstanding that nine ounces had been removed a few minutes before. This was accounted for by the tumor tilting up against the bladder, pressing it against the pubes, so that the glass catheter, when first passed, entered only the lower part of the bladder and not the part above the compression which contained the additional urine. When the abdomen was opened, the bladder was behind the entire length of the incision. It was dissected away from the uterus. The position of the tumor was such that a part of it was in the pelvis, while three and one quarter inches of it extended into the abdominal cavity.

When the patient was lying down, the growth tilted against the pubes, giving rise to retention above the point of pressure (Fig. 471); but when standing up, the tumor tilted away from it, allowing the retained urine to come down into the lower part of the pouch (Fig. 472).

Hysterectomy was followed by a complete cessation of her symptoms.

When the myoma is situated in the cervix, the base of the bladder together with the whole organ is pushed upward until its anterior wall comes into contact with the abdominal parietes. In many cases, adhesions between the bladder and a tumor of the anterior wall of the uterus are so strong as to overcome the resistance of the strongly attached vesical fundus and draw the bladder upward. This traction may be so extreme as to carry the internal urethral orifice up beyond the upper border of the symphysis.

Aside from the symptoms of vesical disturbances, the displacements of the organ also assume great importance in the consideration of the operation for the removal of uterine fibroma, as, if the bladder is not pushed down into its normal position, one might cut through its wall.

*Cancer of the uterus* is the next most frequent pelvic tumor which comes into relation with the bladder. That of the cervix is more common than that of the fundus, and also more liable to involve the bladder. In the presence of this variety of neoplasm, we have to deal not only with obstructive mechanical disturbances which are relatively unimportant, but also with effects due to the extension of the neoplasm into the organ.

According to Ashton, the bladder is more often invaded in the squamous-cell variety than in the adeno-carcinomata. The carcinomatous nodules developing in the trigone give rise to frequent and painful urination. The nodules then break down and ulcerate and the remainder of the bladder is affected by an associated cystitis, its walls being also infiltrated and thickened, later ulcerating in places. The urine contains blood, pus, shreds of tissue and fragments of cancerous tissue. Urinary retention from obstruction at the neck of the bladder is rare (Fig. 474).

Fig. 474.—Uterine Cancer Involving Bladder. (After Skene.)

*Sarcoma of the uterus* may also extend directly into the bladder, the diffuse variety bringing about symptoms similar to those caused by the extension of a cancer of the body of the uterus, while those of the fibrous variety act practically the same as uterine fibroids in displacing the bladder and bringing on the same vesical symptoms. It is only when malignant sarcomatous degeneration occurs in the bladder that we have any direct symptoms referable to the growth.

*Ovarian tumors* of the cystic variety are more apt to be accompanied by

bladder disturbances which are mainly the result of displacement by pressure. If the tumor is intraperitoneal in its development, it may ascend into the abdominal cavity without causing any pelvic disturbance unless adhesions have taken place there; but in case the growth extends down along the broad ligament between its layers, the bladder may be directly pressed upon and its holding capacity diminished.

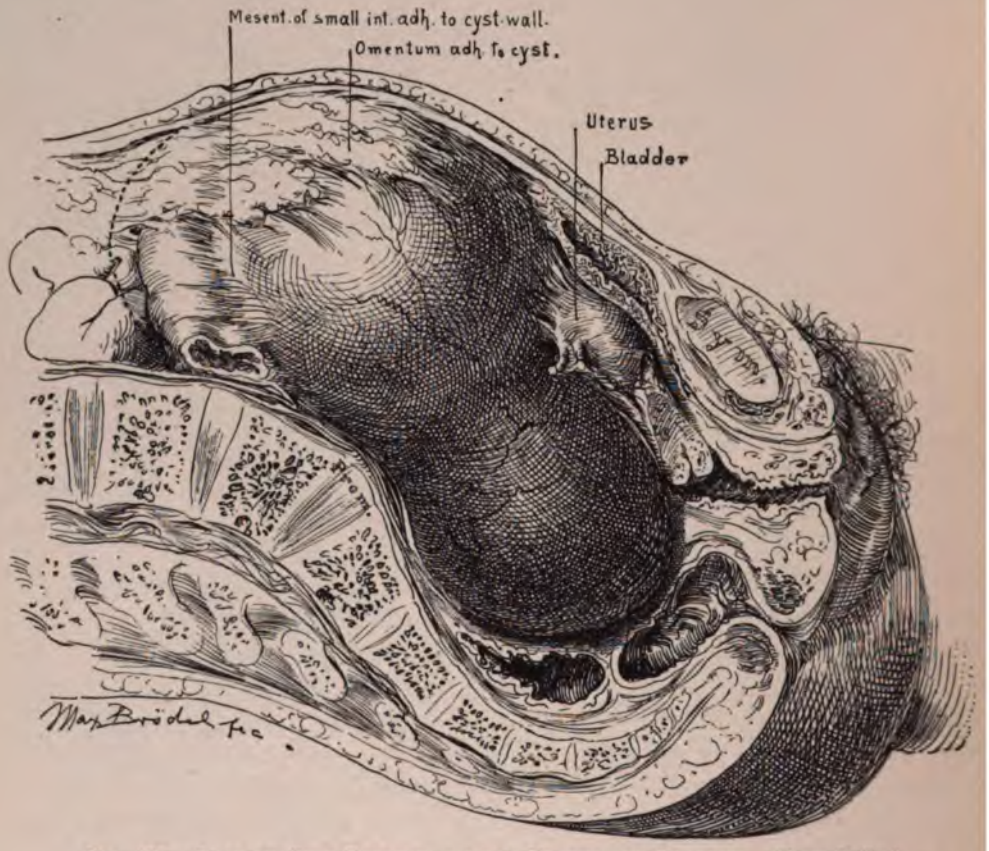


FIG. 475.—OVARIAN CYST PRESSING ON THE UTERUS AND BLADDER. (From Kelly.)

A large cyst may also pull upon both bladder and urethra, and produce vesical irritation or retention, depending on the degree of displacement (Fig. 475).

*Hydatid cysts* occurring in the pelvis are very rare. I have had two cases in men. Both grew between the rectum and the bladder. They tend to hug the bladder rather than the rectum and have the appearance of a bladder with a large amount of urinary retention. They cause but little pain; the principal symptom is frequent and difficult urination and sometimes retention. I have never had a case of pelvic hydatid in a woman. I am inclined to believe

that in the case of a woman, the cyst would grow between the rectum and uterus.

The first case of hydatid that I treated was in a flower vender twenty years old, who was suffering from frequency of urination, a tumor filling the pelvis and reaching to the umbilicus. This resembled closely a very much dilated bladder. The bladder, when examined by a stone searcher, was found to be flattened out in front of a large tumor and extended up in front nearly to the umbilicus.

In this case, the cyst was opened in the median line just below the umbilicus, its contents evacuated, the lining membrane removed, the interior washed out with a strong bichlorid solution and the cavity drained. The cyst wall gradually atrophied to a small cord (Fig. 476).

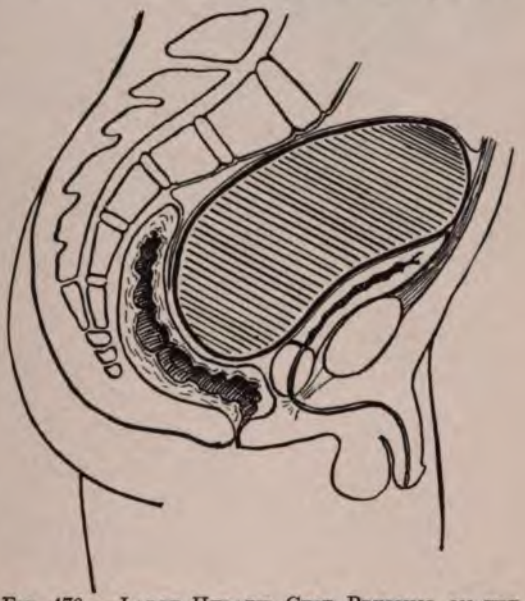

Fig. 476.—Large Hydatid Cyst Pressing on the Bladder, Holding Over Three Quarts of Fluid. (Author's case.)

I presented his case before the Society of Genito-Urinary Surgery and Dermatology, and the consensus of opinion was that it was a case of cyst of the seminal vesicle. Echinococcus cyst was considered improbable, as no hooklets were found. Further experience with hydatids in different parts of the body has convinced me that the absence of hooklets was not sufficient to cause the exclusion of hydatid cyst, and that it was clearly a case of an echinococcus cyst with necrotic contents.

The second case (Fig. 477) was in a gardener seventy years old, who was sent to the hospital as a case of prostatic hypertrophy. He complained of frequent and difficult urination. Examination showed what appeared to be a very large, soft prostate situated high up in the pelvis, with considerable residual urine. After emptying the bladder, there was still the feeling of urine in the bladder on bimanual palpation, and I believed the growth to be a cyst of the prostate in the bladder. Cystoscopy was unsatisfactory, and a suprapubic cystotomy was made. The cyst was found to be behind the bladder, and I incised it through the posterior vesical wall, with the result that a large amount of hydatid fluid and daughter cysts were discharged. The cyst membrane was removed and the cavity swabbed with carbolic acid and alcohol. Notwithstanding this, there was a discharge of small cysts for several weeks, blocking the urethra at times. The discharge of cysts by the urethra gradually

ceased and cystoscopy showed a pouch remaining, similar to sacculations in old obstructive cystitis.

FIG. 477.—HYDATID CYST HOLDING ABOUT EIGHT OUNCES OF FLUID AND DAUGHTER CYSTS. T symptoms and age of the patient pointed to hypertrophied prostate with residual urine, or to a c growing from the prostate into the bladder. A suprapubic cystotomy showed that the cyst outside of the bladder wall in the recto-vesical space. It was opened and evacuated through bladder.

III. PELVIC INFLAMMATIONS AND ADHESIONS.—Inflammatory conditio of the uterus, the tubes and the pelvic cellular tissue are among the most f quent causes of bladder disturbances.

In a series of 176 cases in which irritable bladder was due to agencies o side of the organ itself, Bierhoff found that inflammatory conditions of t uterus and adnexa were the cause in 23, acute pelvic inflammation in 2, chro pelvic inflammation in 24 and pericystitis in 75.

*Endometritis and Metritis.*—Almost all cases, whether acute or chronic, a accompanied by vesical disturbances, the character of which varies according the severity of the inflammation, from a mild degree of irritability to mark dysuria, retention or incontinence. In cases of septic metritis in which the flammation extends out into the perimetrium between the layers of the bro ligament, particularly if the inflammation has been caused by uncleanly ope tions, abortions or accidents during labor, large accumulations of pus may fo

in front or behind the uterus, displacing that organ and pushing or pulling the bladder. The bladder symptoms may be especially severe in such cases, the pain being succeeded by dysuria or retention. If relief from pain comes on suddenly, accompanied by a lowering of the temperature and the appearance of blood or pus and blood in the urine, it means usually that perforation into the cavity of the bladder has occurred. In other cases it may break into the vagina, giving relief, or into the peritoneal cavity, causing a septic peritonitis and death. In these cases, there may be persistent hemorrhage from the uterus or into the perimetrium that causes bladder symptoms similar to an exudate. The cases that do not break into the urinary or genital tract or the peritoneal cavity are, however, those that interest us the most. The rarest form of perimetrium exudate giving rise to a great amount of bladder disturbance is the one in which the pus forms between the layers of the broad ligament anterior to the uterus, so that this organ is pushed back and carries with it the anterior vaginal wall. The bladder is consequently pulled back and in many instances the vesical walls are flattened out against the anterior vaginal wall and the pubes, giving rise to pain and retention.

Fig. 478 shows the bladder of a girl who had a septic endometritis and metritis. The uterus was displaced backward, probably due to the exudate beginning in front of it. The bladder was flattened, extending posteriorly beyond the uterus on either side and anteriorly just above the pubes. The exudate extended even farther, both backward and forward. Her trouble began two weeks before entering the hospital with a vaginal discharge, followed in a few days by pain, hemorrhage, dysuria and retention of urine. Her pulse on entering was running from 100 to 108, and temperature from 101.8° to 102.2° F. During the first week, under internal and local treatment, the patient improved. Her temperature and pulse were lower and she could pass a little urine spontaneously. At the end of the second week, her temperature and pulse were

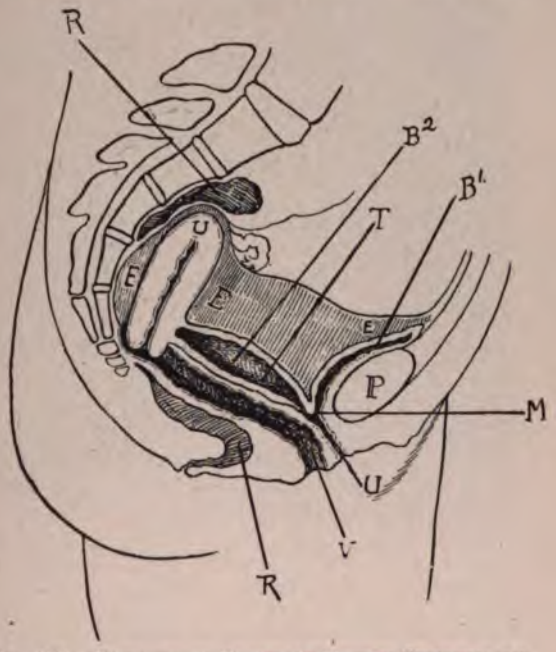


Fig. 478.—Exudate in Front of Uterus Pressing on and Flattening the Bladder. (Author's case.)
*R*, rectum. *U*, urethra.
*B*¹ and *B*², bladder. *V*, vagina.
*E*, exudate. *T*, left ureteral orifice.
*M*, neck of bladder.

normal, but the size of the exudate was increasing, and shortly afterwards there was a recurrence of the fever and septic symptoms developed, necessitating a vaginal incision by the side of the cervix, pushing away the bladder, opening and draining the abscess (Fig. 479). The symptoms quickly subsided and she was able to urinate spontaneously but with difficulty. She was discharged

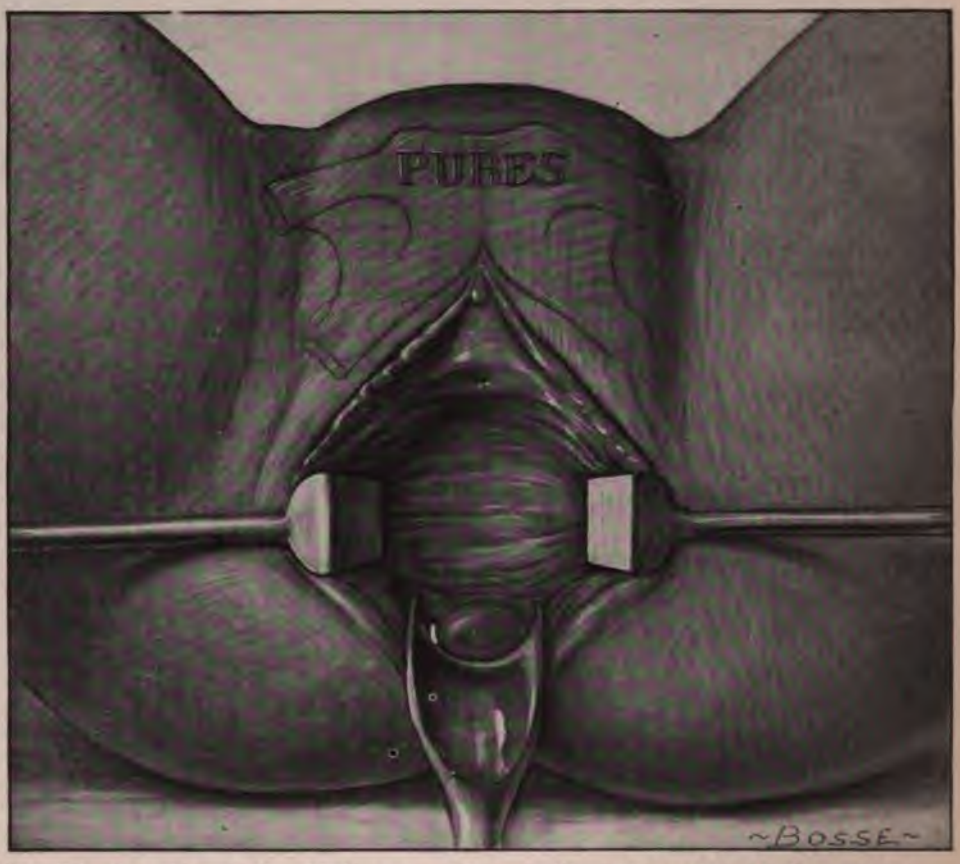


FIG. 479.—SAME CASE AS FIG. 478 SEEN FROM BELOW. The white mark beside the cervix shows the incision.

cured after an illness of seven weeks' duration, during a month of which time she had retention of urine.

Patients with such pelvic exudates displacing the uterus backward and holding it there by adhesions in such a way as to keep the bladder constantly on the streth backward usually have difficult and frequent urination with an uncomfortable feeling in the bladder for the rest of their lives (Fig. 480).

When the exudate begins behind the uterus, as it usually does in cases of septic metritis, the uterus is pushed forward against the bladder, crowding it

against the pubes and giving symptoms of frequency and dysuria. The posterior exudates are more common and less interesting than the exudate in front of the uterus (Fig. 481).

Hematocele of the pelvis forming posterior to the uterus, due to metritis, may push forward the uterus and bladder in the same way.

It can be seen how the exudate has pushed the uterus and bladder upward and forward, at the same time flattening the part of the bladder below the uterus against the pubes and giving rise to retention of urine.

Even long after an exudate of this kind has subsided, the uterus may remain in a forward position and continue to press upon the bladder and interfere with its function (Fig. 482).

Fig. 480.—End Result of Such an Exudate as Shown in Fig. 478 in Front of Uterus. *A*, adhesions. *B*, bladder. (Skene.)

Fig. 481.—Subperitoneal Pelvic Hematocele or Exudate, Showing its Effect on Bladder. (Author's case.)

IV. The Fallopian Tubes.—The Fallopian tube plays a great rôle in bladder interference, not only through being itself adherent to the bladder and pulling upon it, but also through holding other tissues by adhesions in such a way that they rest upon the bladder and interfere with its function. A girl, aged twenty-two, at the City Hospital, complained of great frequency of urination and a feeling of pressure and discomfort in the bladder since her last operation, when the tube and

ovary had been removed from the left side. She was desirous of having operation. I accordingly again opened her abdomen and found that, wh ovary on the right side been removed, the t been left. This had way been turned so th tended behind the uter lateral wall of the pelv left side, to which it come adherent, thus the uterus against the and giving rise to bla turbance through int with its dilatation (F

FIG. 482.—UTERUS HELD FORWARD OUT OF PLACE AGAINST THE BLADDER BY ADHESIONS. Shows the end result of such an exudate. (Skene.)

In another case, th which was large and luted, had been pulle right by adhesions to on that side, whereas der was adherent to th the other side, and, i turned over the left si uterus (Fig. 484).

The Fallopian tube, when adherent to the gut, through holding interferes with both the function of the intestine and of the bladder in case the former rests upon or is adherent to the latter.

*Intestinal Interference.* — An illustrative case is that of a woman who had been complaining of considerable pelvic discomfort and vesical inconvenience, such as difficult, painful and frequent urination. I opened the peritoneal cavity and found

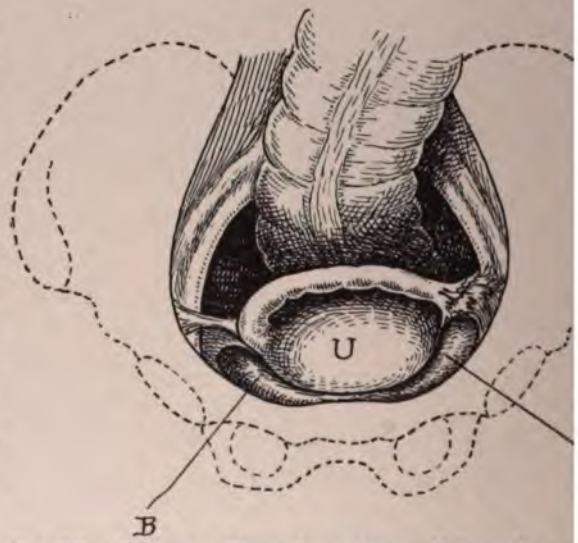


FIG. 483.—FALLOPIAN TUBE PRESSING THE UTERUS FORW THE BLADDER. *U*, uterus. *B*, bladder. (Author's c

omentum covering the front of the bladder and uterus. On freeing and pushing up the omentum, I found that beneath it the sigmoid was adherent to the front of the bladder, on one side, and the cecum to the front on the other, pulling it as well as the uterus backward and interfering with the bladder function. The gut was bound on either side to the tube by old adhesions. The freeing of the adhesions and restoring the sigmoid and cecum to their positions and cutting away part of the omentum relieved the condition permanently (Fig. 485).

Fig. 484.—Bladder Held to One Side of Uterus by Adhesions to the Tube. (Author's case.)

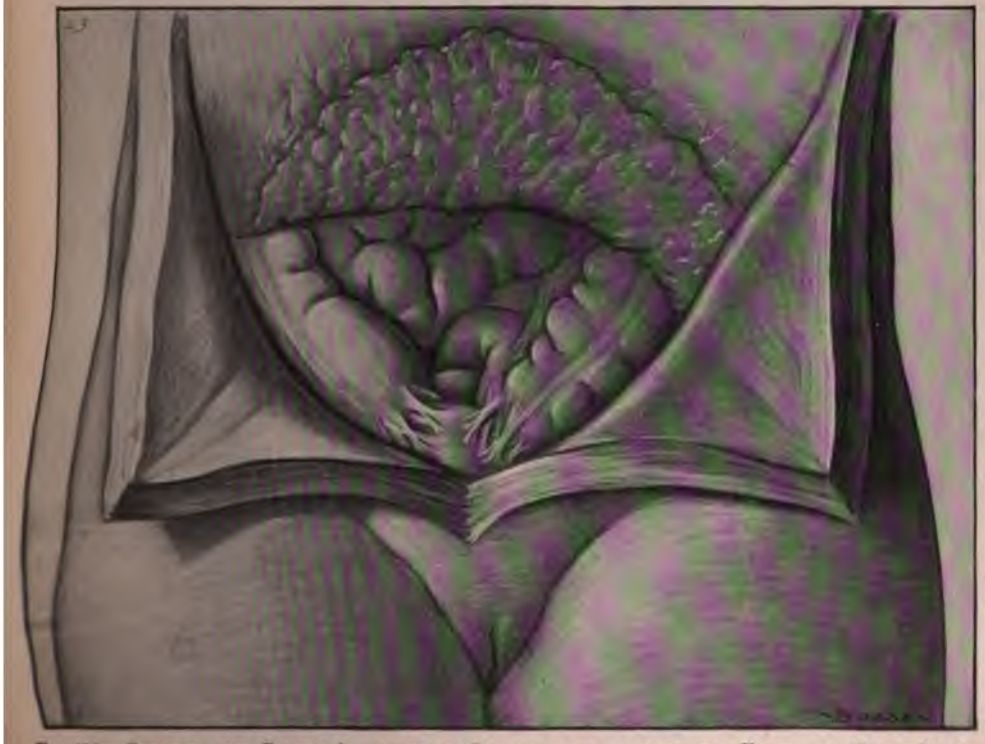

Fig. 485.—Sigmoid and Cecum Adherent to Bladder and also to the Fallopian Tubes Below and Farther Back. (Author's case.)

Another illustrative case of intestinal interference was the following:

A patient complained of frequency of urination, and a bearing-down feeli giving rise to great discomfort. On operation, I found a thick, heavy, sog V-shaped loop of sigmoid resting upon the upper surface of the bladder, tween the uterus and the abdominal wall. This was held in place by adhesi to the Fallopian tube on that side. This inactive loop of sigmoid was a rec

FIG. 486.—LOOP OF SIGMOID, A RESERVOIR RETAINING FECAL MATTER, RESTING ON BLADDER HELD THERE BY ADHESIONS TO THE FALLOPIAN TUBE. (Author's case.)

tacle for the accumulation and probable absorption of feces and gas. The t was removed, thus freeing the intestinal loop, and the patient was kept in with her pelvis elevated. Her bladder symptoms were entirely relieved by operation (Fig. 486).

Still another illustrative case of intestinal interference was the followi

A woman had had complete retention of urine for two months, following appendicitis operation, and had had to be catheterized four times a day. bimanual examination, I could feel through the anterior vaginal wall a th loop of gut, which was just behind the pubes, even when the patient was ly on her back. The uterus was displaced backward. On opening the abdom I found the loop still remained on the bladder. The condition was as follo A posterior displacement of the uterus, the cervix pressing against the neck the bladder and a heavy, soggy loop of prolapsed sigmoid adherent to the Fallopian tube and bladder and pressing on the vesical neck from above. bladder was displaced backward over the anterior surface of the uterus and

neck was held between the uterine cervix and the heavy loop of gut. The patient was absolutely relieved of her symptoms by an operation, breaking up the adhesions and performing an anterior fixation of the uterus, and also keeping the patient's hips elevated (Fig. 487).

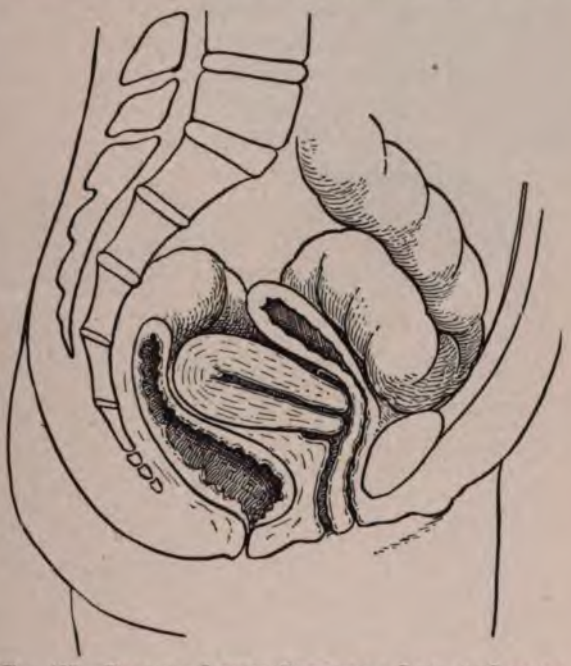

FIG. 487.—BLADDER JAMMED BETWEEN A LOOP OF SIGMOID AND A RETROVERTED UTERUS, CAUSING COMPLETE RETENTION OF URINE. (Author's case.)

V. THE VERMIFORM APPENDIX.—The vermiform appendix is also an occasional cause of bladder disturbance. In acute cases with abscess formation, the pressure of the abscess against the bladder may give rise to dysuria, frequent urination and even retention; whereas, after an acute attack with or without suppuration in which there has been an adhesion of the appendix to the bladder wall, uncomfortable bladder symptoms may follow.

Illustrative case of appendicular pelvic abscess in the female:

A woman was referred to my service at the Columbus Hospital, complaining of pain, with difficult and frequent urination. She had been ailing for several days, during which time she had been confined to the house. She was running a low-grade septic fever. A bimanual vagino-abdominal examination showed a mass behind the uterus about the size of a baseball. I made a low abdominal incision and decided that the tumor was probably a walled-off appendicular abscess situated low down in the pelvis behind the uterus, which pushed the uterus against the bladder. The abscess was opened and drained through a posterior vaginal incision (Fig. 488).

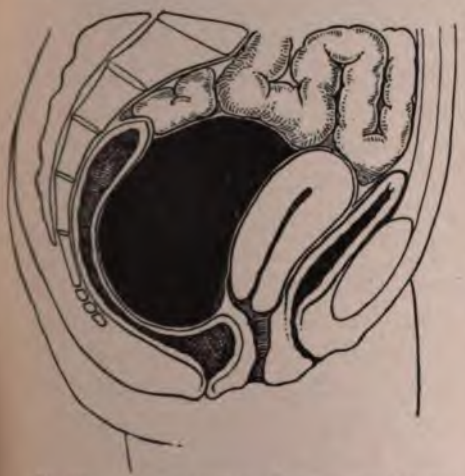

FIG. 488.—APPENDICULAR ABSCESS IN RECTO-UTERINE SPACE PRESSING UTERUS AGAINST BLADDER. (Author's case.)

An illustrative case of an appendicular abscess in the male pressing on the bladder:

A few years after I had had the case of the hydatid cyst behind the bladder that I had opened through an anterior abdominal incision already referred to in this chapter under Tumors and Cysts, a physician who had been present at the operation telephoned me and said that he had a similar case so far as symptoms and shape of the tumor were concerned and that he desired to send the patient to my service at the Columbus Hospital. On examining, I found that, although the size and shape of the tumor, as well as most of the bladder symptoms, appeared to be the same, the patient was septic and the mass was evidently a large abscess.

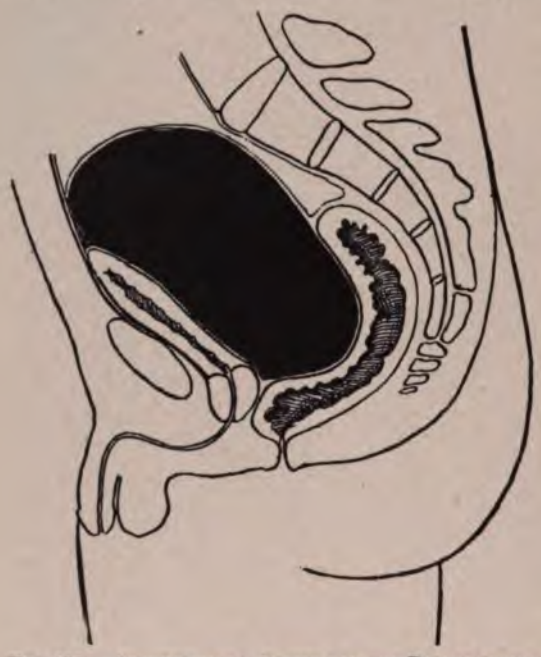

Fig. 489.—Appendicular Abscess in the Recto-vesical Space Pressing Bladder Forward. (Author's case.)

I therefore opened the abdomen above the bladder and found a large abscess present, which I evacuated. The wound did not drain very well after the operation and the patient finally developed an empyema and died (Fig. 489).

These cases of pelvic appendicular abscesses not attended by symptoms in the iliac region are rare, especially in men, and, although they are of extreme interest as an external cause of bladder disturbance, there is another interesting question on the side of treatment to be considered, which is this: Should these cases be drained by a perineal incision extending up between the rectum behind and the prostate and bladder in front in the space in which operative work is done on the prostate and seminal vesicles? I think from an anatomical point of view that this is the proper path; but clinically I believe that we must be guided by what we consider the best course for the particular patient under consideration.

An illustration of how a bladder can be displaced by the appendix is shown in the following case of a weaver, aged forty-four, already referred to under Lateral Displacements of the Bladder.

For three weeks before entering the hospital he had had severe pain in the right iliac region, as well as difficult urination with a sensation of not emptying his bladder. The onset had been very acute. Examination showed a palpable tumor in his right iliac region apparently attached to the iliac bone. It was hard and not tender to the touch. Pulse and temperature nor-

mal. Diagnosis: Chronic appendicitis. Operation: Incision over the tumor. On opening the peritoneum, the omentum was seen. On separating the omentum, what seemed to be the cecum was found beneath it, filling the right iliac fossa with a hard mass which was thought to be the appendicular exudate. After freeing adhesions, the bladder was found to be pulled over in this region around the cecum and adherent to the appendix behind it. There was no pus present. Recovery was uneventful. There is no doubt

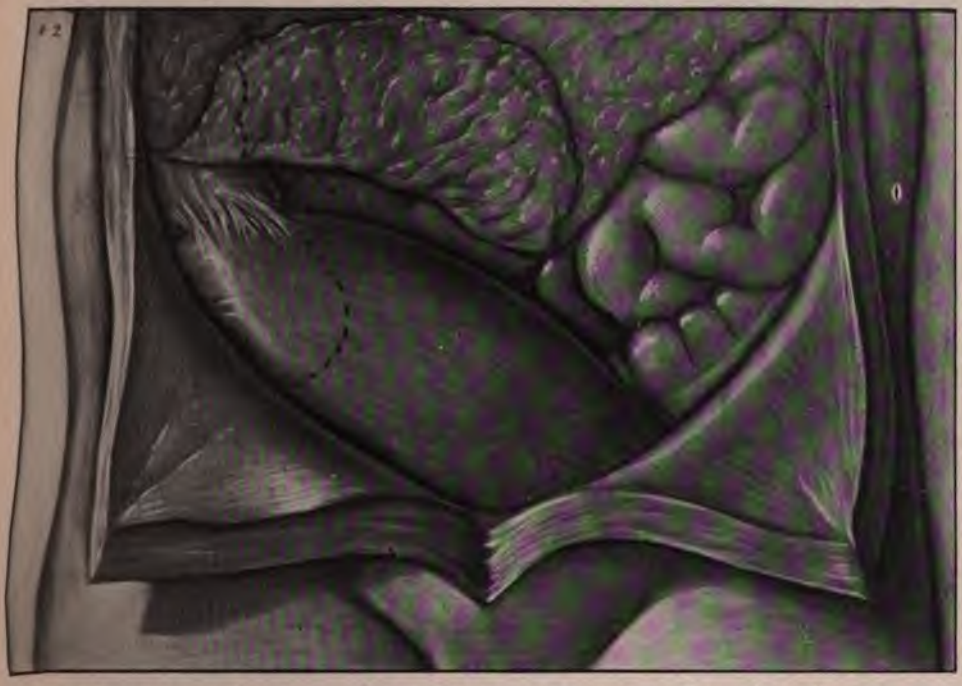

FIG. 490.—BLADDER PULLED OUT OF THE PELVIS AND ACROSS THE RIGHT ILIAC FOSSA BY THE APPENDIX. (Author's case.)

but that, if the bladder had not been freed and restored to its normal position, this bladder inconvenience would have been very much increased (Fig. 490).

VI. THE OMENTUM.—The omentum plays an important rôle in bladder displacements. It goes to the aid of and covers inflamed areas and, by forming adhesions, it protects them. It also walls off the remainder of the peritoneal cavity, thus preventing its contents from becoming infected in case of suppuration. The result is, however, that the omentum remains adherent to the tissues that it has been protecting, and, in case the inflammation extends, it will follow and also become adherent to the adjacent tissues. A good example of the involvement of the omentum can be seen in the part it plays in forming a portion of the wall of an appendicular abscess. Evidences of its activity can also be

seen in cases of salpingitis. In connection with ascent of the bladder, omentum is often a causative factor.

An illustrative case is that of a man attending my clinic at the P Graduate Medical School. The patient had been suffering from great blad

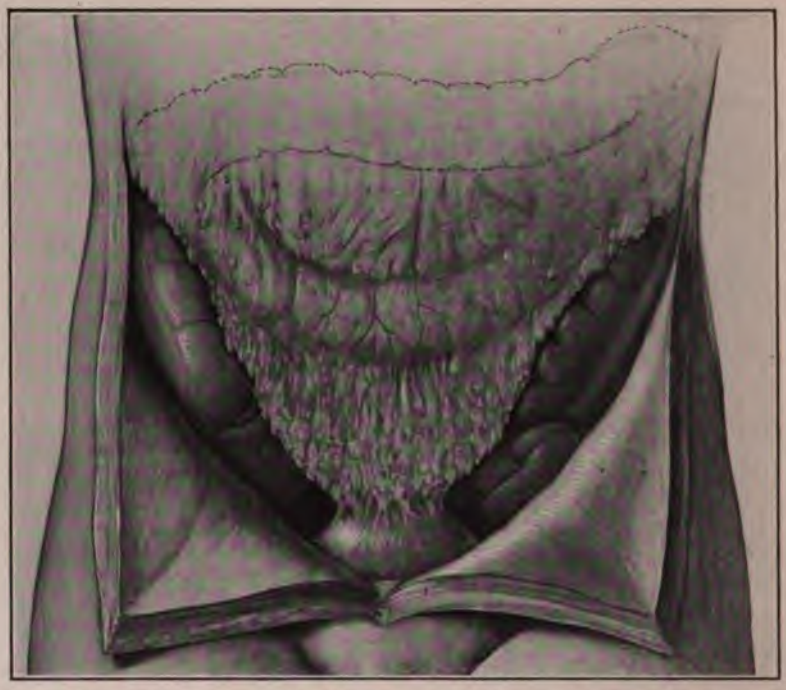

FIG. 491.—OMENTUM PULLING ON THE BLADDER. (Author's case.)

irritability and pain for a year that could not be accounted for by examin the urethra, prostate, bladder or vesicles. He had a cystitis for which I tre him for some time without much relief. I finally concluded that it mus due to an adhesion between the anterior bladder wall and the abdominal w resulting from a suprapubic lithotomy some years before. I made an ex peritoneal incision above the pubes and, not finding any extraperitoneal in ference, I opened the peritoneal cavity and found that the omentum was herent to the roof of the bladder and that it had pulled the transverse c down in a loop until within a short distance of the vesical wall. It was to see in this case how, every time the bladder tried to empty itself, it pu on the transverse colon, and, when the transverse colon filled with gas, it pu up the bladder, thus giving rise to the bladder irritability. I dissected omentum away from the bladder and shortened it, after which the transv colon resumed a normal position. The patient was relieved of his sympt by the operation (Fig. 491).

Adhesions of the omentum to the bladder are especially frequent in women, and, if the omentum is in turn adherent to other viscera, they may also react on the bladder and the bladder may in turn react on them, thus causing a general disturbance of the pelvic contents.

As an illustrative case, I will cite the case of a young woman who was troubled with frequency of urination, dysuria and an uncomfortable sensation, whose bladder was displaced both upward and backward. She had been operated upon for tubal trouble. Her condition did not improve and her bladder was much worse. She was constipated, accumulations of gas and feces in the rectum pulled on the uterus and bladder, giving rise to disturbed function in the latter organ. Menstruation was painful, due to adhesions about the uterus. I operated on her again and found the uterus displaced anteriorly, the bladder lying

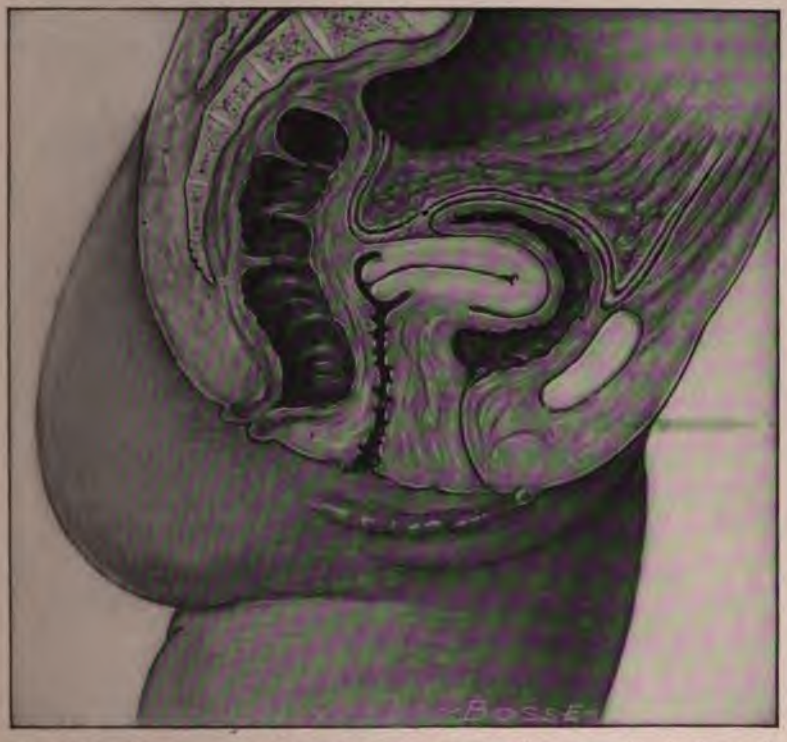


Fig. 492.—Omentum Adherent to Bladder and Rectum. (Author's case.)

under the uterus from its normal point of attachment to the fundus, then extending over its fundus to the posterior surface of the organ. The bladder, uterus and adnexa and the rectum were covered with adherent omentum. In this way the function of the three organs was disturbed and they were constantly interfering with one another (Fig. 492).

# CHAPTER XLV

## OPERATIONS IN AND ON THE BLADDER

Operations on the bladder are of the following kinds:

(1) Superficial extravesical, when a plastic operation is performed for exstrophy.

(2) Intravesical, when the operation is performed in the interior of the bladder by means of an instrument introduced into it through the urethra.

(3) Suprapubic cystotomy, when the operation is performed through an incision made over the pubes into that organ.

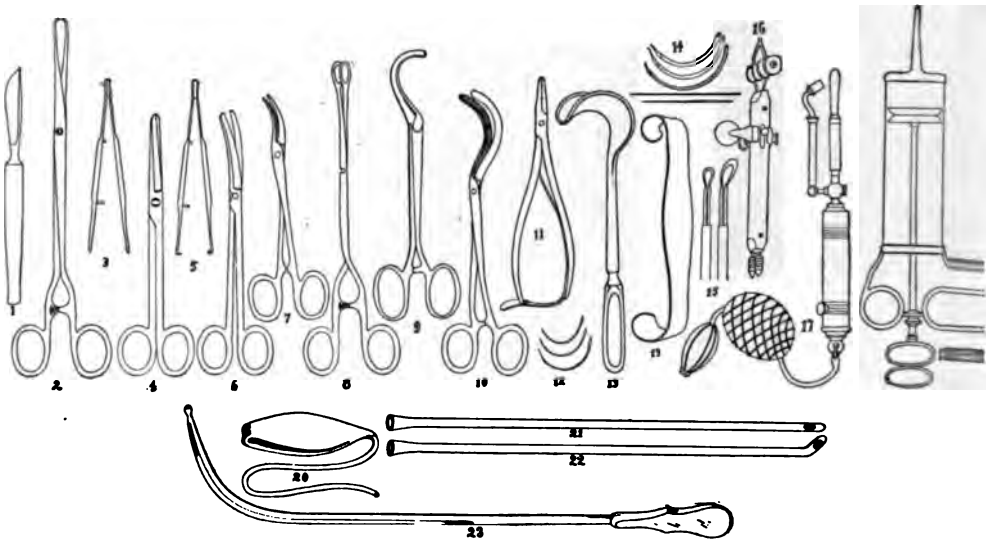

Fig. 493.—Instruments Used in Bladder Operations.

*1*, Scalpel.
*2*, Bullet forceps.
*3*, Thumb forceps.
*4*, Straight scissors.
*5*, Mouse-tooth forceps.
*6*, Curved scissors.
*7*, Curved artery clamp.
*8*, Sponge forceps.
*9*, Tumor forceps of Guyon.
*10*, Curved pedicle clamp.
*11*, Needle holder.
*12*, Round curved needles.
*13*, Retractor.
*14*, Hagedorn and straight needles.
*15*, Cautery blades.
*16*, Cautery handle.
*17*, Thermo-cautery (Paquelin).
*18*, Large piston hand syringe (16 cz.).
*19*, Retractor.
*20*, Rectal bag.
*21*, Straight catheter.
*22*, Elbowed catheter.
*23*, Tunneled lithotomy guide.

(4) Partial cystectomy, when a portion of the bladder is excised.

(5) Cystectomy, when the whole bladder is removed.

(6) Perineal cystotomy, when the operation is performed through an incision made into the bladder by way of the perineum and the perineal urethra.

(7) Colpocystotomy, when the operation is performed on the bladder through an incision in the anterior vaginal wall.

## I. EXTRAVESICAL OPERATIONS

**Autoplastic Operation** (*Author's Method*).—The technique of the autoplastic operation as I perform it, differs but little from the Roux-Wood method. These differences of detail are, however, of the greatest importance as far as successful issue is concerned. The patient is placed in the dorsal position (Fig. 494) with catheters in the ureters. The first step is to mark out the flaps.

The anterior or upper flap (*ABC*, Fig. 495) extends upward from the upper margin of the bladder (*AC*) to a length one quarter longer than the bladder itself; its width is equal to that of the greatest transverse vesical diameter. Two lateral flaps are then marked out which extend from the margin of the bladder on either side, obliquely upward and outward for a distance equivalent to half the length of the anterior flap. The incision then curves around and extends down as far as the penis. The width of the flaps (*CDE* and *AFG*) is two thirds of the width of the bladder. The catheters marking the location of the ureters are now withdrawn.

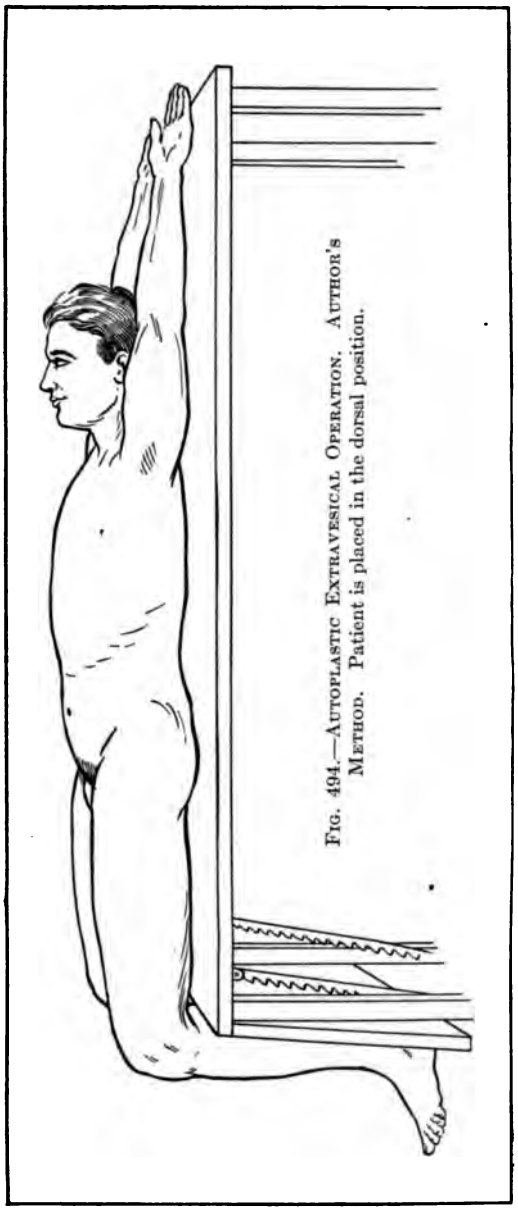

Fig. 494.—Autoplastic Extravesical Operation. Author's Method. Patient is placed in the dorsal position.

The prepuce is then drawn forward until its entire length and width can be estimated. A transverse incision is made along the entire width of the prepuce for half its depth (*HI*, Fig. 496) at a point on its under (outer) surface opposite the sulcus. From the point (*I*) the prepuce is then split longitudinally nearly to its end (*J*). When the flap (*IJH*) has been straightened out (Fig. 497), it is seen to extend beyond the end of the glans penis.

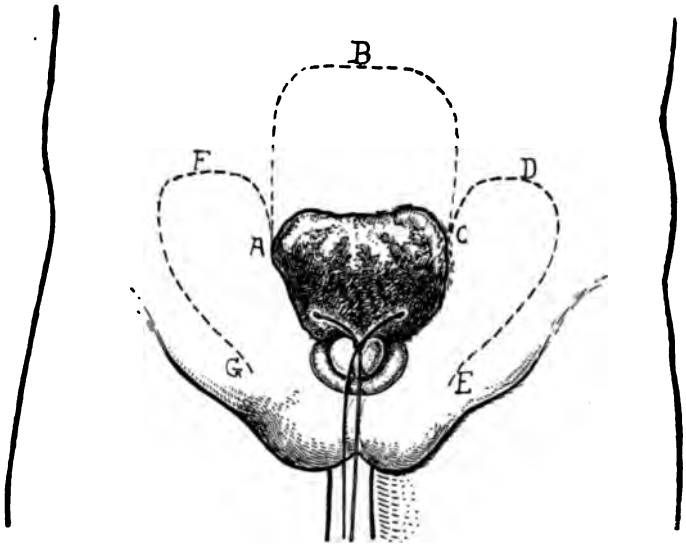


FIG. 495.—AUTOPLASTIC EXTRAVESICAL OPERATION. The uncovered surface of a case of exstrophy of the bladder with the upper anterior and lateral flaps marked out and the catheters in the ureters.

The anterior flap is now dissected free down to its base (*AC*), from which point it hangs over the bladder, its skin surface coming in contact with the bladder mucous membrane. The lateral flaps

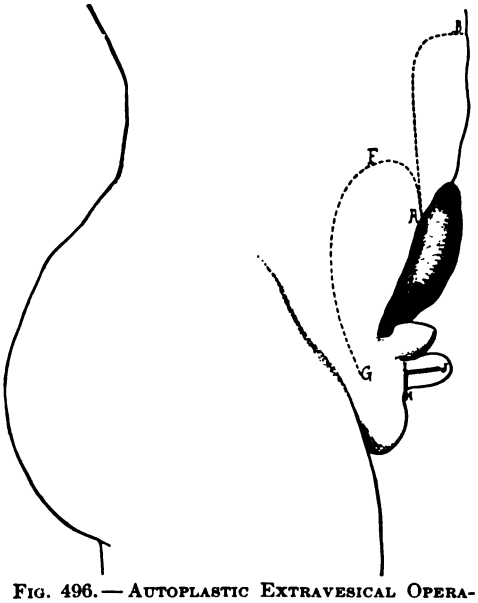


FIG. 496.—AUTOPLASTIC EXTRAVESICAL OPERATION. Side view of the marked out upper anterior and lateral flaps, and the manner of splitting the prepuce to make the lower flap.

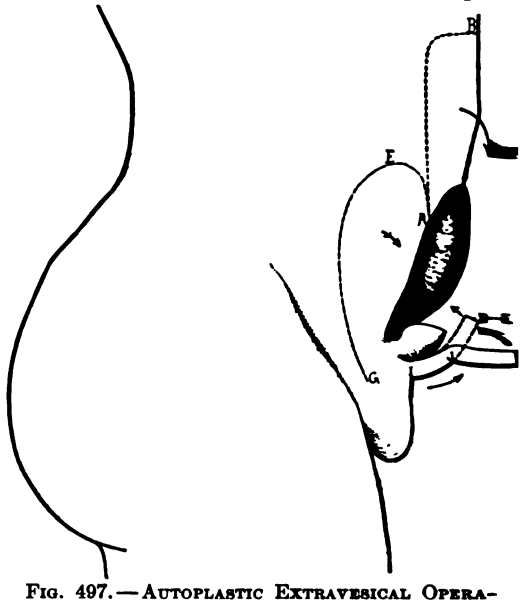


FIG. 497.—AUTOPLASTIC EXTRAVESICAL OPERATION. Preputial or lower flap stretched after it has been split.

are dissected free and hang from their bases (*CDE* and *AFG*) at the level of the penis. At this point of the operation, the ureteral catheters are passed through the urethra and bladder into the ureters on either side and are left there. A soft-rubber catheter, 16 or 18 French, is passed through the urethra into the bladder and retained there. The object of this is to allow drainage past the field of operation, so that the tissues will not be soaked with urine.

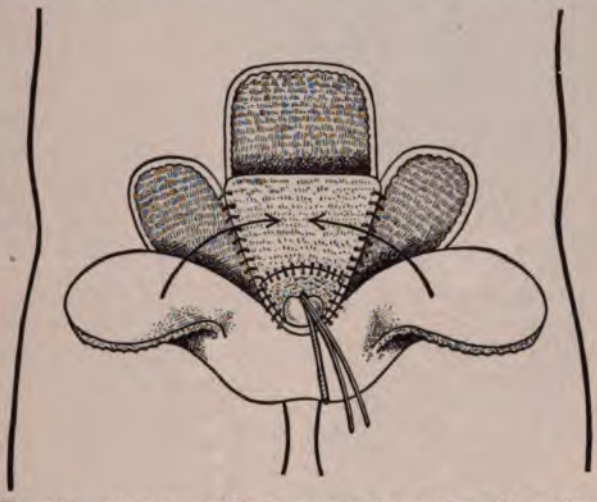

FIG. 498.—AUTOPLASTIC EXTRAVESICAL OPERATION. Lower flap buttonholed, with glans penis pulled through it, and then drawn up and united with the upper flap. The catheters passed. This forms the first covering of the bladder.

The raw edges of the anterior flap are sewed to the raw surfaces left after dissecting away the lateral flaps on either side (Fig. 498). A transverse buttonhole incision is now cut in the lower flap made by splitting the prepuce of a sufficient size to allow the glans to be drawn through it. After this, the free edge of the lower flap is sewed to that of the upper or anterior flap and the raw edges of their sides are sewed to the raw surface from which the lateral flaps were taken. The bladder is now entirely covered.

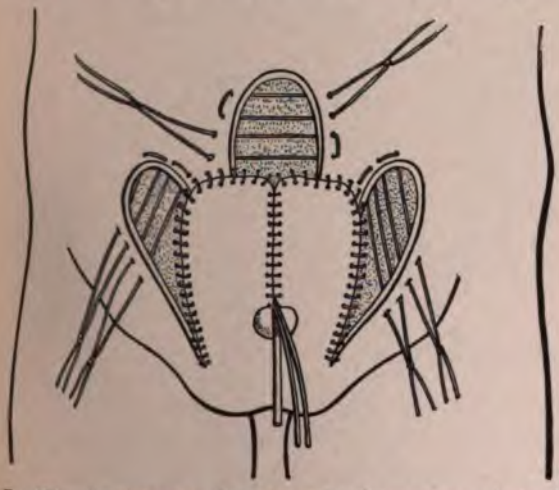

FIG. 499.—AUTOPLASTIC EXTRAVESICAL OPERATION. Lateral flaps drawn over the bladder and united, forming the second covering.

The lateral flaps *CDE* and *AFG* are now brought together in the median line in such a way that they cover with their raw surfaces the raw surfaces of the united anterior upper and lower flaps, beyond which they extend for some distance. They are now sutured one to the other in the median line and on their external borders to the raw surfaces from which they themselves have been dissected. The bladder has now been covered by two layers;

the first layer made from the anterior abdominal and preputial flaps, v
second layer is made from the lateral flaps (Fig. 499). All of these l
their raw surfaces sutured to those of the surrounding tissues on both si

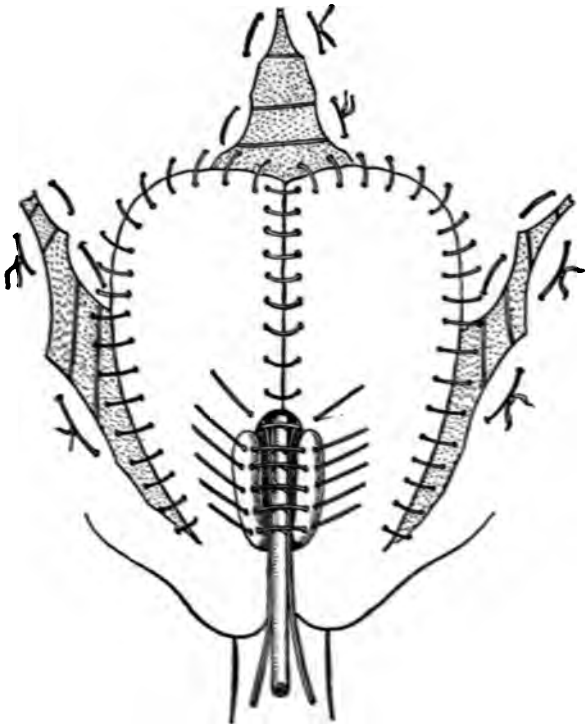

Fig. 500.—Autoplastic Extravesical Operation. Covering in of the raw surfaces above and to the sides of the bladder by approximating the edges of the wound by mattress sutures, also the sutures passed for uniting the sides of the penis and urethra.

catheters are held in their by strings to prevent th slipping out. Mattress are now passed through ders of the raw surface a bladder, from which the abdominal flap was taken as the borders of the sid

The mattress sutures drawn taut and tied, the skin over the raw su much as possible. Th surface of the penis is f on either side and int sutures are passed (Fi The sutures are then ti verting the epispadic gu a urethral canal (Fig. 5 did the operation rep the chapter on Exstr 1894 and exhibited t

before and after treatment at the Academy of Medicine, the Urological Society and the Genito-Urinary Society.

**Transplantation of the Ureters with the Intestine.**—This is considered by some as an operation for exstrophy of the bladder that is superior to the plastic operation. Of the methods of transplantation employed, that of Maydl is considered the best.

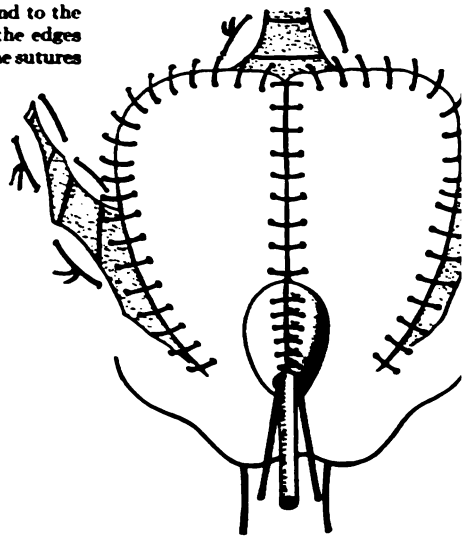

Fig. 501.—Autoplastic Extravesical Ope
The sides of the canal are again united

*Technique of Maydl's Operation.*—(1) Cut away the exposed vesical mucosa. (2) Then dissect from this the part of the bladder wall that includes the ureters and the interureteral band with the ureters attached (Fig. 502). This is excised but not removed. (3) The operative field is now thoroughly cleansed. (4) The peritoneal cavity is opened and a loop of sigmoid is brought down into the operative field; then a vertical incision is made through one of its longitudinal bands. (5) One side of the excised piece of bladder wall is placed beside one side of the vertical incision in the gut, the piece of bladder having its mucosa facing outward. The two sides are then united by through-and-

FIG. 502.—MAYDL'S OPERATION OF TRANSPLANTATION OF THE URETERS. Surface of the bladder in a case of exstrophy, with the piece of bladder marked out that is to be excised and planted in the large intestine sigmoid.

FIG. 503.—MAYDL'S OPERATION. Lower border of the excised portion of the bladder sutured to the right side of the incision in the sigmoid.

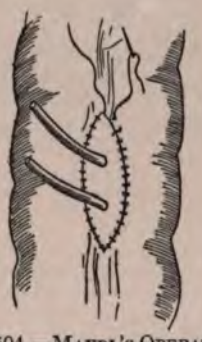

FIG. 504.—MAYDL'S OPERATION. Entire piece sewed in and strengthened by a Lembert suture.

through sutures (Fig. 503), after which the piece of bladder is turned over and into the opening in the gut in such a way that its mucous side corresponds to that of the gut. (6) The remaining side of the vesical piece is now sewed to the other edge of the gut incision, after which the entire line of union of gut and bladder is again sewed with Lembert sutures (Fig. 504). (7) The abdominal wall is then closed. This operation is more satisfactory than any other ureterointestinal implantation, as the normal ureteral valves and sphincters are retained and the danger of infection of the kidneys by way of the ureter is thus lessened.

## II. INTRAVESICAL OPERATIONS

Intravesical operations are, as a rule, performed by the introduction into the bladder of an operating cystoscope having certain attachments by means of which the operator can perform lithotrity, curette its walls, remove tumors by the snare and cautery or remove foreign bodies.

**Lithotrity and Litholapaxy without the Cystoscope.**—LITHOTRITY.—The crushing of a calculus in the bladder is performed by means of a *lithotrite*. Of the instruments used, the two generally preferred are those of Thompson and Bigelow, the former of which was generally used until the latter was devised.

The lithotrite of Thompson (Fig. 505, *A*) appeals to the practitioner on account of its simplicity. It is composed of two parts or blades, a male and a female, and when the former is placed in the latter the instrument is complete and in working order.

If we examine the female blade (Fig. 505, *B*), we will see that it is about sixteen inches long and is composed of four parts: A shaft (*a*) with a slot, at the

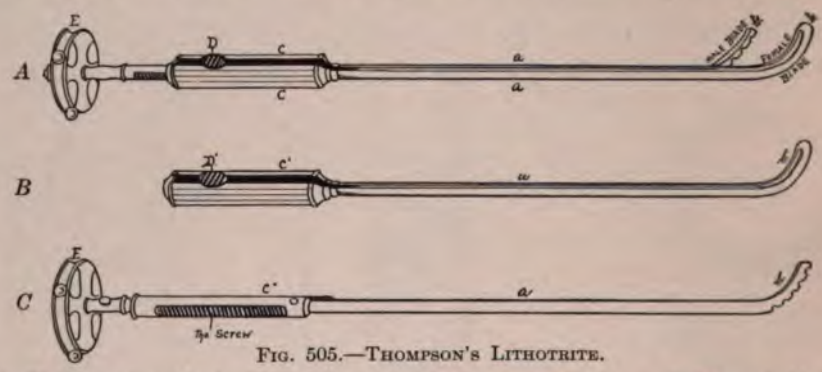


FIG. 505.—THOMPSON'S LITHOTRITE.

*A*, The lithotrite with the blades opened. *B*, The female blade. *C*, The male blade.

distal end of which is a beak (*b*) of the same shape as a sound, but fenestrated, and at the proximal end (*c*) a hollow handle about three times the diameter of the shaft in thickness. There is also a catch (*d*) seen on the handle which is used in locking the instrument.

The male blade (Fig. 505, *C*) is about an inch and a half longer than the female and is composed of four parts: The shaft (*a*), the curved beak (*b*) shaped like that of the female blade, except that it is notched and fits into it when the instrument is closed; a solid dilatation (*c*) twice the size of the remainder of the shaft, containing the screw of the instrument and fitting into the hollow handle of the female blade; a wheel (*e*) at its proximal end which turns the screw after the instrument has been locked.

When the two blades are put together and the instrument is complete, it is possible to manipulate the lithotrite as follows: Hold it by the handle with the left hand and by the wheel with the right. The male blade can be made to slide along the slot in the female by pulling on the wheel in such a manner that its beak is separated from the beak of the female blade, and then, by pushing it back again, it returns into the beak of the female blade. Or it can be made to stop at any point on its return toward the female blade of the instrument by pulling the catch (*d*) toward the wheel, which locks the instrument by causing two small metal pieces concealed in the handle of the female blade on either side to protrude. These two pieces are concave, with a thread in their concavity of the same size as that of the screw in the thickened portion (*c*) of the male blade. The threads of the two blades fit into each other, so that the blades

cannot then be made to slide either backward or forward; but if the wheel at the proximal end is turned, the screw in the male blade turns in the thread of the two protruding plates in the handle of the female blade in such a way that the curve of the male slowly approaches and enters the curve in the female blade.

This mechanism is necessary in lithotrity, as, once having grasped the stone between the male and female blades, it is difficult to hold it there without locking the instrument, and until it is locked it is not possible to have the advantage of the powerful screw worked by the wheel of the instrument that is necessary to crush the stone into pieces.

Fig. 506.—Bigelow's Lithotrite Opened.

The Bigelow instrument (Fig. 506) is an improvement on the Thompson in many ways, as, on account of the female blade not being fenestrated, the instrument is not in so much danger of being impacted with fragments. It is also less liable to cause traumatism of the bladder by directing sharp splinters of stones against it, as occurs when the blade is fenestrated. The manner of locking and unlocking the lithotrite, which takes place many times during an operation, requires less time, as it is simply necessary to turn the collar of the instrument, which can be done without changing to any degree the position of the hand.

After the calculus has been crushed the fragments have to be removed. In olden days, after one crushing, as many of the fragments as possible were voided with the urine and after a few days there was another crushing and another voiding of pieces. Bigelow, in 1878, formulated a plan of crushing the stone entirely at one sitting and at the same time removing all the fragments. He called this operation litholapaxy.

Litholapaxy.—Litholapaxy consists, therefore, in crushing the stone by the same technique as in lithotrity, but in one sitting and at the same time removing the fragments by an apparatus called an *evacuator*. It is therefore understood that litholapaxy is the procedure of crushing the calculus and removing the pieces in one operation.

The evacuator (Fig. 507) is the apparatus for the second part of the operation. It consists of three parts:

(1) A rubber bulb which has a glass receiver at its lowest extremity; a socket with a cut-off at the top and another lower down on the side, also with a cut-off.

(2) Straight and curved metal catheters, one end of which is introduced into the bladder, after which it is connected with the socket on the side of the bulb of the evacuator.

(3) A piece of rubber tubing that connects the socket on the upper part of the bulb with a jar or pitcher of water.

Fig. 507.—The Evacuator.

*Technique of Litholapaxy.*—The patient is anesthetized by general or local anesthesia and is placed in the dorsal position. A catheter is passed through the urethra into the bladder and its cavity is washed out, after which six ounces of boric-acid solution are injected and allowed to remain. The lithotrite is introduced into the bladder in the same manner as a sound. After the beak has entered, its convexity is pressed against the posterior wall of the bladder (Fig. 508). The wheel of the male blade is then drawn out, thus pulling its curve away from that of the female until it reaches the anterior wall. It is then pushed toward the female blade again in an effort to catch the stone in case it has fallen between the jaws of the blades of the instrument which are in the posterior part of the floor of the bladder (Fig. 509). A shaking or jarring of the patient in the region of the hips will often so jostle the stone as to make it drop into the jaws of the lithotrite. If it has not, the blades are again separated and the lithotrite is turned first to one side of the bladder and then to the other, the operator each time slowly opening and closing the blade in an endeavor to grasp the stone between them (Fig. 510). In case it has not caught

Fig. 508.—Litholapaxy. The lithotrite in the bladder, its convexity pressed against its posterior wall. (After Hartman.)

the calculus in this way, the beak of the instrument is turned downward and the blades are again opened and closed in an effort to catch the stone (Fig. 511),

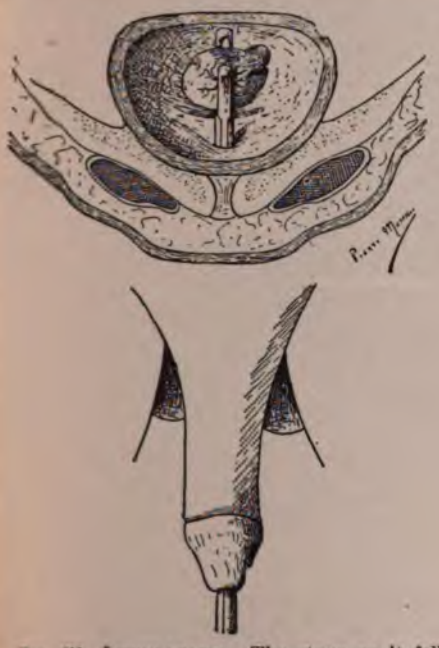

FIG. 509.—LITHOLAPAXY. The stone as it falls into the jaws of the lithotrite. (After Hartman.)

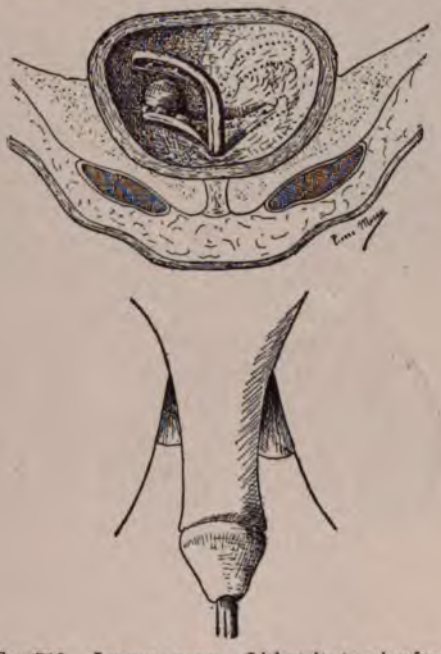

FIG. 510.—LITHOLAPAXY. Lithotrite turning from side to side in an effort to grasp the stone. (After Hartman.)

as sometimes the stone is in a postprostatic pouch. In this latter case, an endeavor has to be made at times to pry it out with the female blade and then to catch it between the two blades. It is also sometimes necessary to put the finger into the rectum and push the stone from behind the prostate into a position in which it can be grasped. In any case, when the stone is caught between the two blades, they are locked by pulling the catch in the handle of the instrument, if the Thompson instru-

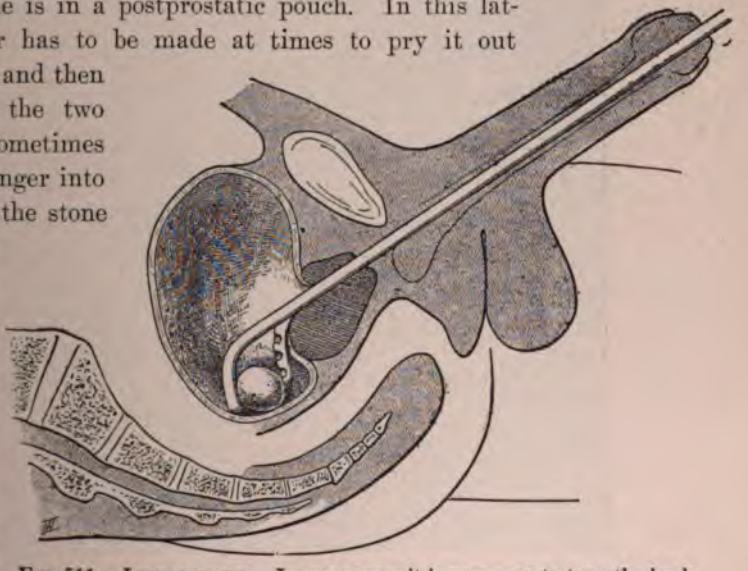

FIG. 511.—LITHOLAPAXY. In some cases it is necessary to turn the beak down and to endeavor to catch the stone in this position. (Hartman.)

ment is used, or by turning the collar with the Bigelow lithotrite. The of the instrument with the calculus between them are then turned upwar the middle of bladder, and wheel at the d end of the litho is screwed d crushing the s (Fig. 512), which the fragm fall to the botto the bladder. Th strument is t manipulated ag in the same ma

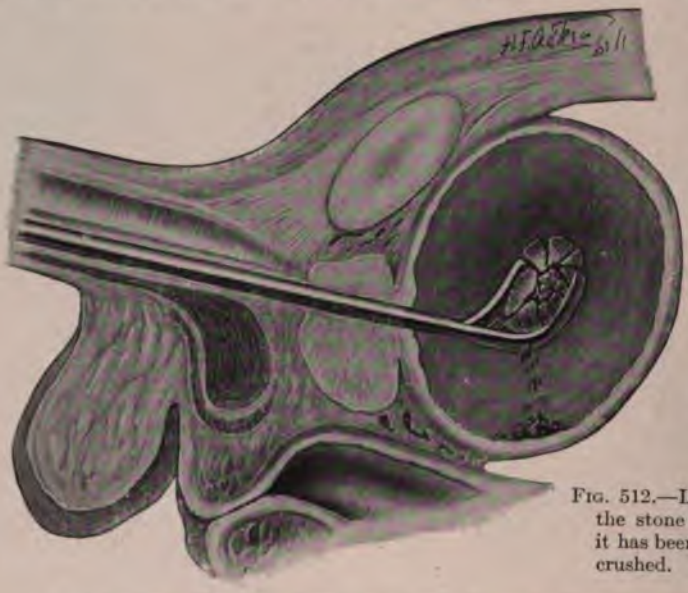

Fig. 512.—Litholapaxy. Showin the stone is held in the bladder it has been caught and while it is crushed. (From Watson.)

Fig. 513.—Litholapaxy. Showing the position of the lithotrite and the hands during the cr and when looking for fragments. (After A. T. Cabot.)

in an effort to pick up some of the largest fragments, which are in turn caught in a similar way (Fig. 513).

After the existing fragments are all of a small size, the evacuator should be employed. The metal catheter of the evacuator is passed into the bladder and its beak rests on its lowest portion. The end of the catheter protruding is at an angle of 45 degrees with a line drawn perpendicular to the operating table. The bulb is connected by its nozzle on the side with the socket in the catheter and the rubber portion is squeezed (Fig. 514). This sets the water in the bladder in

FIG. 514.—LITHOLAPAXY. Showing how the evacuator is held and the bulb is squeezed. (After A. T. Cabot.)

movement and the fragments of the stones are whirled about in the bladder, after which they settle to the bottom, and, as the catheter with its large mouth is lying there, the smaller fragments fall into it. The pressure on the bulb is then relaxed and the water and fragments of the calculi are sucked up into it. In passing over the mouth of the bottle, the pieces of stone fall into it, while others drop in during the moment of rest before the bulb is squeezed again (Fig. 515).

Then the bulb is once more compressed and fragments are again hurled about the bladder, sinking into the mouth of the catheter, and are once more sucked up and fall into the glass receiver when the pressure is removed from the

bulb. This process is continued until all the smaller pieces have been evacuated. If some fragments are found still remaining, as can be detected by the clinking of the stone on the evacuating tube after they have fallen to the bottom of the

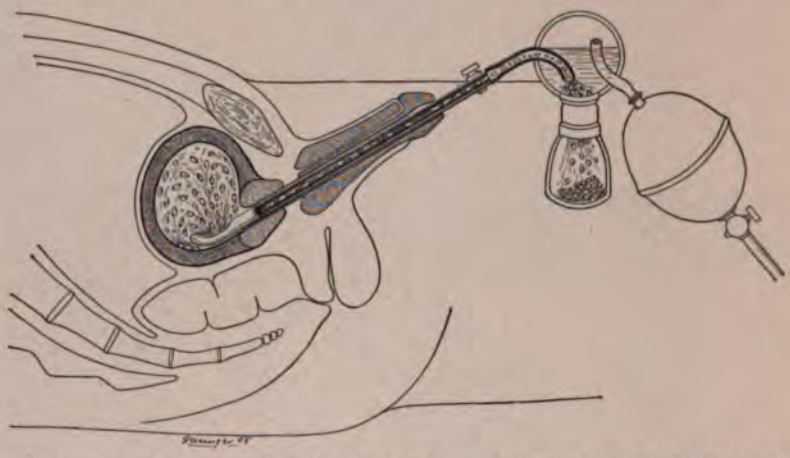

FIG. 515.—LITHOLAPAXY. Showing how the fragments are thrown about the bladder, settle in the mouth of the evacuator, and are then sucked up the tube and fall into the bottle.

bladder, and they seem too large to be evacuated, the catheter is removed, the lithotrite is again inserted and the crushing once more resorted to.

**Cystoscopic Operations.**—The intravesical operation is performed by means of an operating cystoscope

REMOVAL OF TUMORS BY OPERATING CYSTOSCOPE.—The operating cystoscope of Nitze, the instrument mostly used, has a snare attachment principally employed for the removal of sessile or polypoid tumors and closely resembles

FIG. 516.—SNARE ATTACHMENT OF THE NITZE OPERATING CYSTOSCOPE FOR REMOVING TUMORS.

his catheterizing instrument (Fig. 516). The snare passes through the cystoscope and is controlled by a small carrier which the operator can extend and move in such a way as to spread out the wire over a tumor and also draw it in again until it is concealed in the instrument. The snare can be connected with an electric cautery.

*Technique.*—The bladder is washed out, and anesthetized by injecting five ounces of a one quarter of one-per-cent solution of cocain, after which the patient is placed in the dorsal position with the lower extremities supported by means of knee rests or lithotomy uprights. The cystoscope is then introduced

and the tumor localized. After this the snare carrier is moved until the snare is spread out in the bladder. It is then passed around the tumor and is slowly drawn in until it holds snugly the base of the tumor close to the bladder wall (Fig. 517). The electrical connections are then made with the snare, the current is turned on and the wire burns its way through the pedicle of the tumor. When the tumor is a large one, portions of the tumor may be removed in several sittings. In any event, the patient urinates out the fragments of the tumor after the operation.

Fig. 517.—Snare Spread Over a Tumor.

Fulguration for the Destruction of Tumors.—At the present writing, it appears to me that the best method of treating vesical tumors is by fulguration. This method of treatment is by means of the Oudin current derived from a high-frequency machine. My experience with this method has been very limited and in the work done in my clinic the current has been derived from a Wappler machine.

According to Beer, who first employed high frequency in the treatment of bladder tumors, the rheostat should be placed vertically, so that one half the resistance is thrown into the circuit; the spark gap in the muffler should be approximately one tenth to one eighth of an inch. The electrode, which is a simple six-ply cable of copper wire, is thoroughly insulated with rubber and is cut off squarely at the vesical end. Any double-catheterizing cystoscope can be used, either direct or indirect, whichever is preferred by the operator.

*Technique.*—The bladder is washed out as thoroughly as possible with sterile water and then filled with a 1 : 400 cocain solution. The copper fulgurating electrode, corresponding in size and shape to a No. 6 ureteral catheter, is inserted through one of the catheter tunnels of the cystoscope in the same way in which a catheter is introduced, without protruding from its distal end.

The instrument is then passed into the bladder and the tumor is looked for. When it is found, the proximal end of the electrode is inserted into the distal end of the interrupter and the insulation is removed for about a quarter of an inch to allow the current to enter the cable. The cable coming from the machine is inserted into the handle of an interrupter just behind it and the current is turned on and the spark gap brought to one tenth or one eighth of an inch. The electrode is pushed a short distance in among the villi of the tumor and the finger is pressed on the interrupter in such a way as to throw in the current (Fig. 518). The operator watches through the cystoscope the effect of the current on the growth. No spark is seen, even when full current is thrown on

without any resistance. Gas is, however, generated freely and is seen to bubble out of the growth. The part of the tumor on which the end of the electrode is placed is seen to be blackened or carbonized. After an application of from fifteen to thirty seconds, the current is discontinued by means of the interrupter

FIG. 518.—FULGURATION OF A BLADDER TUMOR.

*L*, the cable from the house current lighting the cystoscope.
*P*, the power coming from the high-frequency machine.
*F.W*, the fulgurating wire passing from the interrupter through the catheterizing passage in the cystoscope to the tumor.

and the end of the electrode is moved to some other part of the growth. After it has been treated in one or more places for a number of seconds each time, depending on its size, the current is cut off.

As the electrode is withdrawn from the growth, it may stick to it so that the tumor moves with the electrode, and, when it breaks away from the growth, a piece of cooked tumor may come away with it. In the case of bleeding from the growth, if the electrode be placed on the bleeding point the hemorrhage will cease. These applications of fifteen to thirty seconds each may be made to numerous parts of the growth, and in one of Beer's cases they aggregated four minutes. Each of these applications is sufficient, through the amount of heat produced, to cause a well-marked necrosis. The necrotic areas gradually separate from the tumor base and are thrown off in the urine. This separation continues for some time, depending on the number of applications made. The resulting base is usually smooth and not ulcerating.

CURETTING OF ULCERS.—In the case of an ulcer, the curette is employed. It is hidden in the concavity of the cystoscope and the distal end protrudes beyond its eyepiece. The ulcer having been located, the tip of the cystoscope is passed just beyond it while the visual part of the instrument is just over the lesion. The proximal end is then so manipulated as to draw the curette quickly over the ulcer. The curette is then pulled back into place and the instrument is withdrawn.

Cauterization of Ulcers.—This can be done by injecting silver or carbolic through a catheter. The end of a ureteral catheter is cut off and the instrument is passed through the catheterizing attachment of a cystoscope until its cut end is against the ulcer. The surgeon then holds the cystoscope in one hand and the catheter in place with the other while an assistant injects a few drops of pure carbolic acid or a saturated solution of nitrate of silver from a syringe into the catheter. The surface of the ulcer is immediately seen to turn white. The cauterizing fluid escaping from the mouth of the catheter has immediately cauterized the ulcer and then become mixed with the solution in the bladder.

Lithotrity by means of a stone-crushing apparatus in an operating cystoscope cannot be recommended, as, with the exception of small phosphatic calculi, it is extremely difficult to accomplish on account of the lack of power in the instrument (Fig. 519). It is far better in most cases to become acquainted with the interior of the bladder by means of an observation cystoscope and then to crush the stone with a lithotrite.

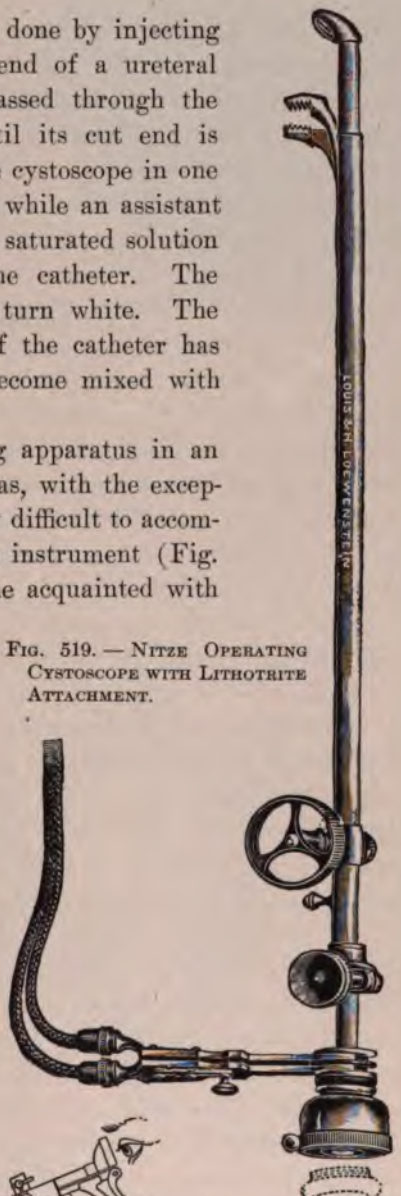


Fig. 519. — Nitze Operating Cystoscope with Lithotrite Attachment.

Removal of Foreign Bodies from the Bladder by Means of a Cystoscope.—The foreign bodies usually found in the bladder are broken-off pieces of catheter, hairpins, pencils and twigs. For the removal of these articles Cabot's "seizer," operated by means of a direct cystoscope, is probably the best. This mechanism consists of thin pieces of wire with teeth at the ends. The two ends are introduced through the catheterizing compartment along the side

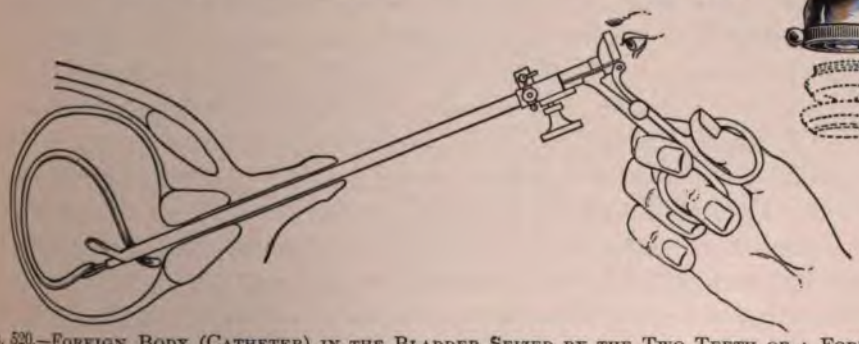

Fig. 520.—Foreign Body (Catheter) in the Bladder Seized by the Two Teeth of a Foreign Body Extractor. (Ayres's tongs.)

of the telescope. Ayres's extractor or "tongs" are also useful. The examiner then looks through the cystoscope, locates the foreign body and catches it between the jaws of the extractor (Fig. 520). He then pulls it up against the convexity of the instrument and draws it out with the cystoscope. This is an admirable contrivance for withdrawing a piece of catheter from the bladder, as one extremity of the wire seizer can be inserted into the lumen of the catheter while the other can grasp it from the outside.

## III. SUPRAPUBIC CYSTOTOMY

This operation consists in opening the bladder over the pubes. It is resorted to for removing calculi, foreign bodies and tumors from the bladder; for draining the bladder in cases of vesical tuberculosis; for enucleating the prostate gland in cases of prostatic hypertrophy; for removing prostatic calculi; for draining the bladder in cases of prostatic hypertrophy with obstruction; and for establishing a permanent fistula in cases of inoperable malignant growths of the prostate gland.

In performing suprapubic cystotomy, excepting in cases of calculi and foreign bodies, it is desirable to have the largest opening that can be obtained without injuring the peritoneum.

**Apparatus and Instruments Used.**—The table used is one that can be so adjusted as to place the patient in the Trendelenburg position or in any degree between the horizontal dorsal position and the full Trendelenburg. A table, having a wheel at the side of the table near the anesthetist, is the most convenient. The instruments used are the rectal bag or colpeurynter, catheters soft and woven, varying in size from 16 to 32 French, a piston syringe holding from four to six ounces, scalpels, blunt hook, scissors, thumb forceps, artery forceps, bullet forceps, sponge forceps, retractors, needle holder, round needles, plain and chromic catgut varying in size from No. 1 to No. 3, glycerin, very hot boric acid solution and peroxid of hydrogen (Fig. 493).

**Repair of a Ruptured Bladder.**—It is well to consider the repair of a bladder with a tear in its wall, before we treat of suprapubic cystotomy. The reason of this is because, in suprapubic cystotomy, the patient is usually in the Trendelenburg position, as the operation is extraperitoneal; whereas, in rupture of the bladder, it is not easy to say without thorough exploration if the rent in the bladder is extra- or intraperitoneal. In any case, it is important to have the patient flat on his back during the operation in order to keep any urine that has leaked from the bladder in the pelvis and to prevent it, as much as possible, from flowing up into the abdominal cavity, which might occur if the patient were placed in the Trendelenburg position.

The steps of the operation for ruptured bladder then are briefly as follows: The patient is placed flat in the dorsal position; an incision is made over the

pubes down to the peritoneum; the extraperitoneal space is opened and, if urine or blood is found present, it is evacuated and the tissues thoroughly cleansed with peroxid solution. The rent in the bladder is then looked for.

In case it is found, a blunt hook is placed in it and the wound is drawn up until it is in the operative field. The forefinger of one hand is then introduced into the bladder and its interior is thoroughly explored. If the forefinger finds the wall of the bladder intact, the operator knows that he has to do only with an extraperitoneal tear. On the other hand, if his finger protrudes through an opening in the vesical wall into the space behind the peritoneal reflection on the bladder, he knows that he has to do with an extra- and intraperitoneal tear.

If, on cutting down to the peritoneum, he finds no fluid in the extraperitoneal space and no opening in the bladder, he will know that, in case a tear of the bladder is present, it must be intraperitoneal. In the case of intraperitoneal rupture, there will probably be considerable distention and fluid in the peritoneal cavity that will be apparent even through the peritoneum.

In other cases, the incision down to the peritoneum may show a tear in the bladder and also in the peritoneum.

In any event, having cut down to the peritoneum and the extraperitoneal part of the bladder anteriorly, the region should be thoroughly cleaned. If an extraperitoneal rent in the bladder is found, a blunt hook is inserted in it and the rent is pulled into the incision as well as possible. Then the sides of the abdominal incision are retracted. The margins of the wound in the bladder wall are closed by Lembert sutures of chromic gut No. 2 going through the muscular wall (Fig. 521). A drain as placed down to the line of bladder incision and the abdominal wound is closed down to the drain. A catheter is then introduced into the bladder through the urethra to be retained.

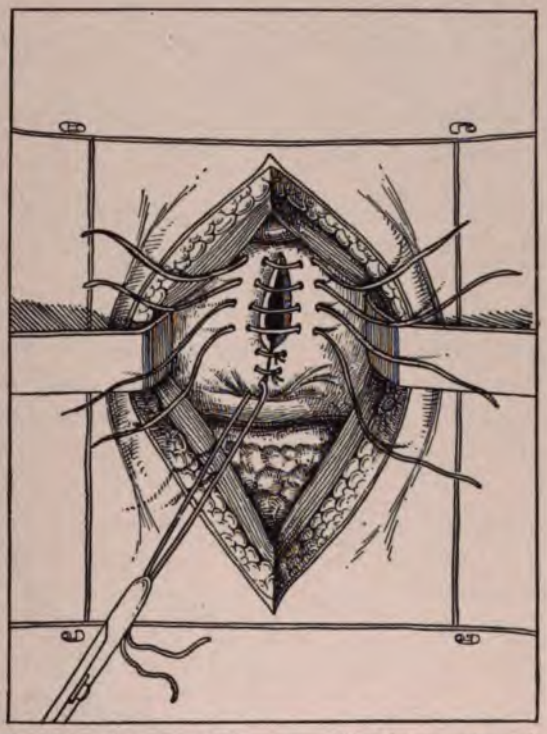

FIG. 521.—RUPTURE OF BLADDER. Showing an extraperitoneal tear in the anterior wall of the bladder with sutures passed through the margin of the wound ready to be tied.

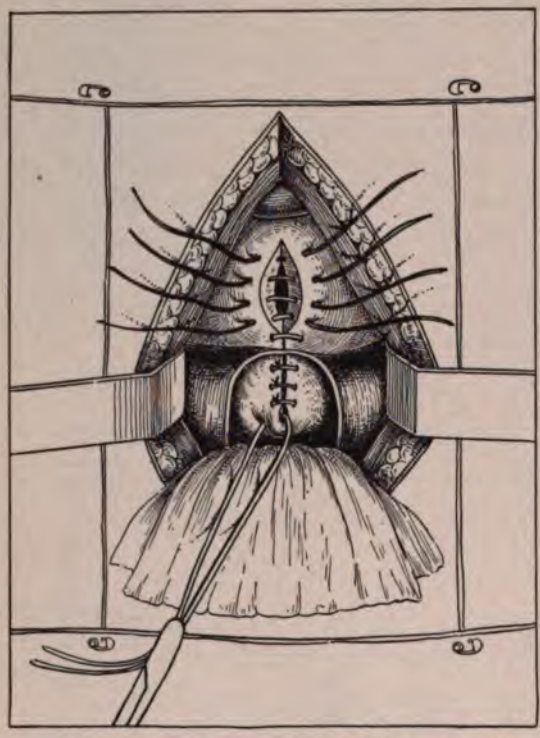

FIG. 522 A.—RUPTURE OF THE BLADDER. The intraperitoneal tear closed by Lembert sutures.

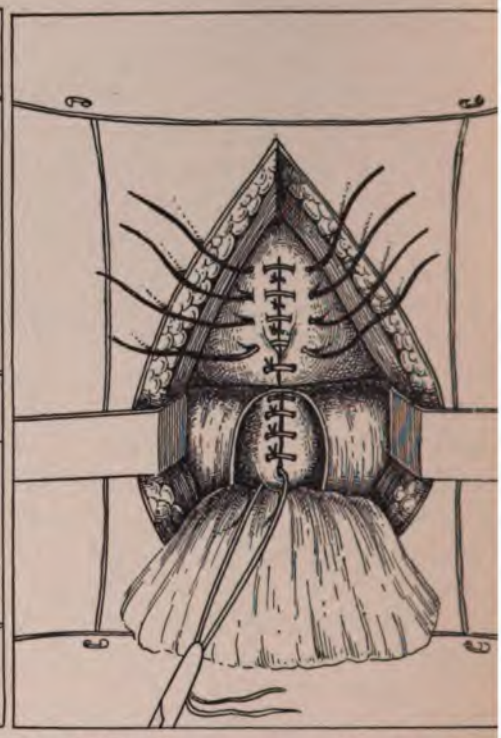

FIG. 522 B.—RUPTURE OF THE BLADDER. The extraperitoneal tear also closed.

When extra- and intraperitoneal tears are both present, the seat of the injury is thoroughly cleansed. The peritoneal fold is cut through. The intestines are drawn back and walled off by abdominal pads (Fig. 522 A). The intraperitoneal part of the bladder wall is thoroughly explored. Evidences of injury

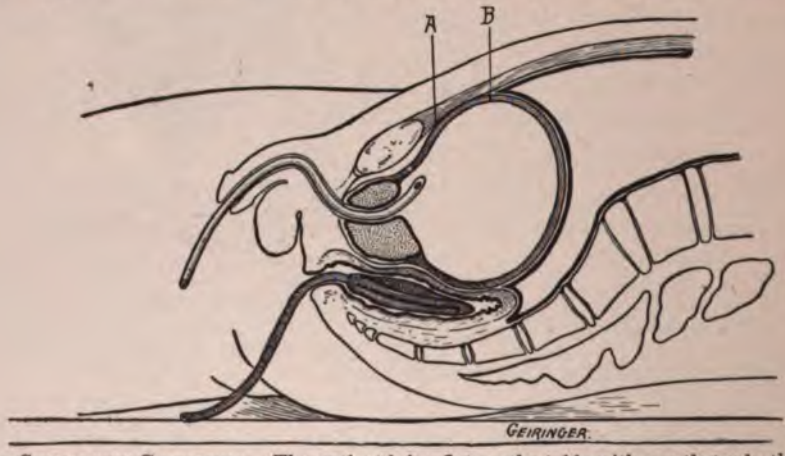


FIG. 523.—SUPRAPUBIC CYSTOTOMY. The patient lying flat on the table with a catheter in the bladder and a rectal bag in the rectum. The bladder has been filled to such a degree that the peritoneal fold (*B*) has been pushed up, showing the space (*A B*) of bladder wall uncovered by peritoneum.

of the intestines are also looked for. The intraperitoneal rent in the bladder is closed by Lembert sutures (Fig. 522 A) of chromic gut No. 2, as just described. The extraperitoneal wound is then sutured. The peritoneum is then united, leaving simply enough room for a fine soft-rubber catheter to extend along the incision just within the peritoneal cavity. A retained catheter is kept in the bladder and a gauze drain down to its wall, until the wound has united.

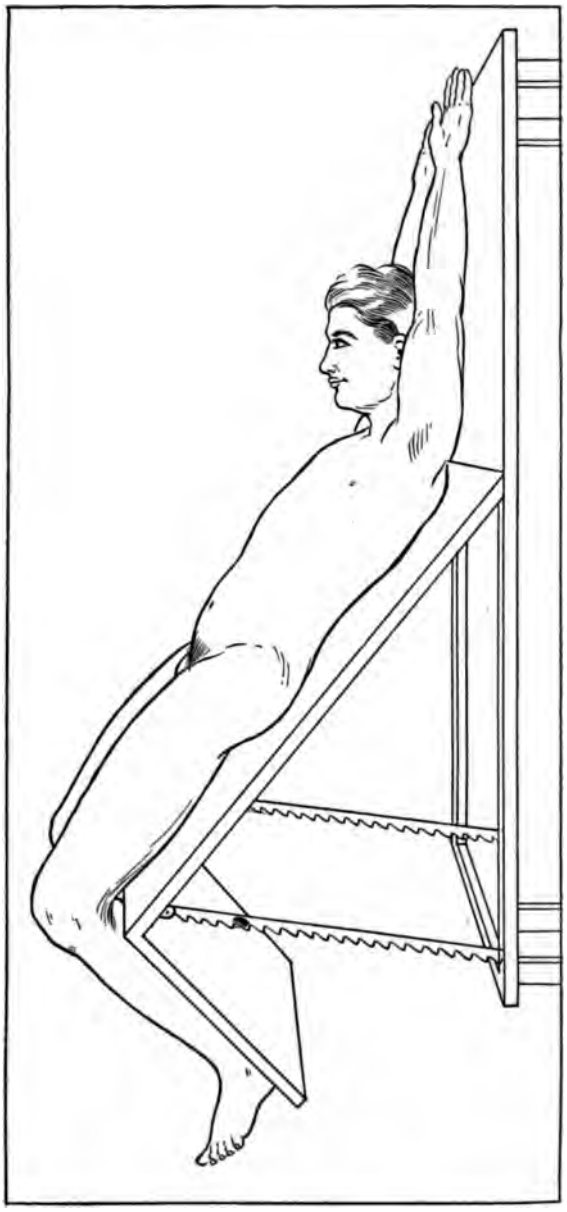

Fig. 524.—Trendelenburg Position for Suprapubic Work on the Bladder.

In case there is an intraperitoneal rupture of the bladder but with no rupture of the parietal peritoneum, an incision has to be made through the peritoneum in the median line and the fluids in the peritoneal cavity evacuated. Most of the fluid is composed of urine and blood and is in the pelvis, pressing the bladder down. The escaped fluid is soaked up and the parts are washed and cleaned with peroxid and salt solution. The intestines are pulled up and walled off with abdominal pads. The rent is caught with a blunt hook and sewed together by a through-and-through plain catgut suture and then over this by a Lembert suture going through the serous and muscular coats. The parts are again washed and the peritoneum closed, leaving sufficient space for a smooth drain which should remain down to the bladder wound for from twenty-four to forty-eight hours. A retained soft-rubber catheter is left in the bladder and the abdominal wound is closed.

**Technique of Suprapubic Cystotomy.**—The patient is placed upon the tabl in the dorsal horizontal position and anesthetized. A soft-rubber catheter, No 16 to 20 French, is introduced into the bladder, and a rectal bag into the rectum From ten to twelve ounces of boric-acid solution are introduced into the blad der through the catheter by means of the piston syringe and the catheter i clamped to prevent the fluid from escaping, care being taken not to exert force as at times these pathological bladders are very feeble and might rupture. Thi pushes the peritoneal fold above the pubes (Fig. 523).

The patient is then changed to the full Trendelenburg (Fig. 524), afte which from eight to ten ounces of fluid are injected into the rectal bag and th tube coming from it is clamped. This reflects the peritoneal field still farthe upward, as is seen in Fig 525, owing to the pressur of the dilated rectal ba upon the bladder whic flattens and elongates it Everything is now ready for the operation and the operator and his assistants take their places about the patient (Fig. 526).

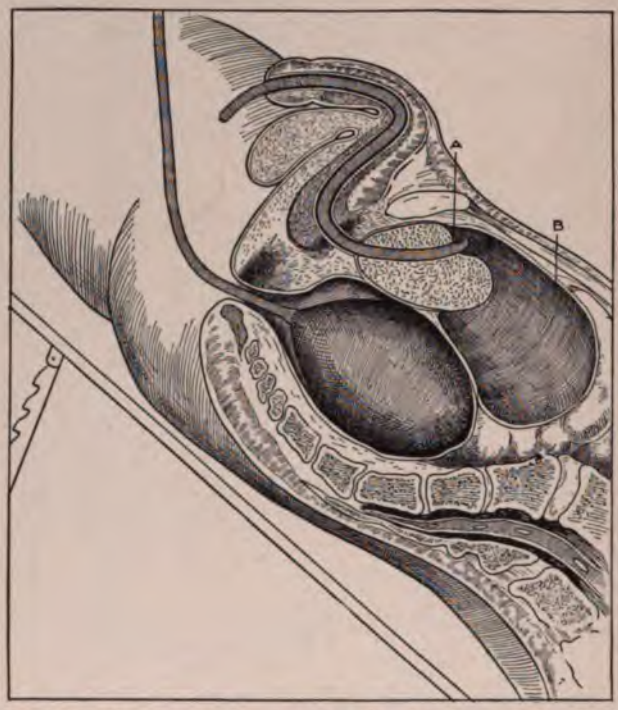


FIG. 525.—SUPRAPUBIC CYSTOTOMY. Showing the rectal bag filled and the consequent increased extent of the bladder wall (*A B*) that is uncovered by peritoneum.

An incision is now made in the median line from the pubes toward the umbilicus, about four inches in length (Fig 527). This cuts through the skin and fascia down to the rectus muscle. The fibers of the muscle are then split, showing the peritoneum, the peritoneal fold and the fatty tissue over the bladder. The sides of the muscle and fascia are now gently retracted. The operator now takes a piece of moist or dry gauze and wipes the tissues away from the bladder with an upward movement, from just beneath the pubes until he has come down to the bladder wall He then continues to wipe up fat and the peritoneal fold until he has sufficient bladder area exposed for the operation (Fig. 528), or the resistance is so great that he fears he may injure the peritoneum by trying to push up the reflection still farther. I personally prefer to do this with a piece of mois

gauze rather than with my finger alone, as I was formerly accustomed. When there is considerable pericystitis I often use dry gauze, although I feel that

FIG. 526.—SUPRAPUBIC CYSTOTOMY. Position of the operator and his assistants.

there is more danger of injuring the peritoneum with dry than with moist gauze.

After the peritoneum has been pushed up as far as desired, the bladder wall is seen as a globular mass with engorged veins. The bladder wall is grasped at his point with the bullet forceps and a traction suture passed through the walls. Then the bladder is punctured just below the traction suture, which marks the reflection of the peritoneum upward, in the median line, and the incision continued down to the pubes (Fig. 529).

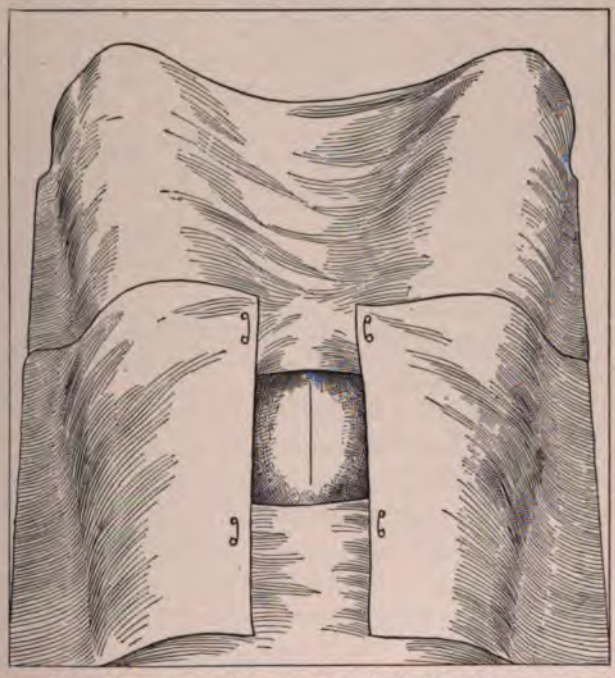

FIG. 527.—SUPRAPUBIC CYSTOTOMY. An incision is now made in the median line about four inches in length through the skin and fascia down to the rectus muscle.

The gush of fluid from the bladder wall is very pronounced and it is sometimes very bloody. A traction suture is then placed through either side of the bladder wall and the wall also retracted with retractors, as in Fig. 530.

**Suprapubic Lithotomy.**—If a calculus or foreign body is present, it is removed with the fingers or a pair of sponge forceps (Fig. 531). The incision need not be as long in cases of stone as in tumor or other cases. The finger is then inserted again into the bladder and its interior is palpated. If more calculi are found, they are in turn removed. The bladder should be palpated after all the stones have been removed to see if any fragments have been left behind, as pieces are sometimes chipped off by the forceps. For the remainder of the operation, see Closing of the Bladder Wound at the end of the chapter.

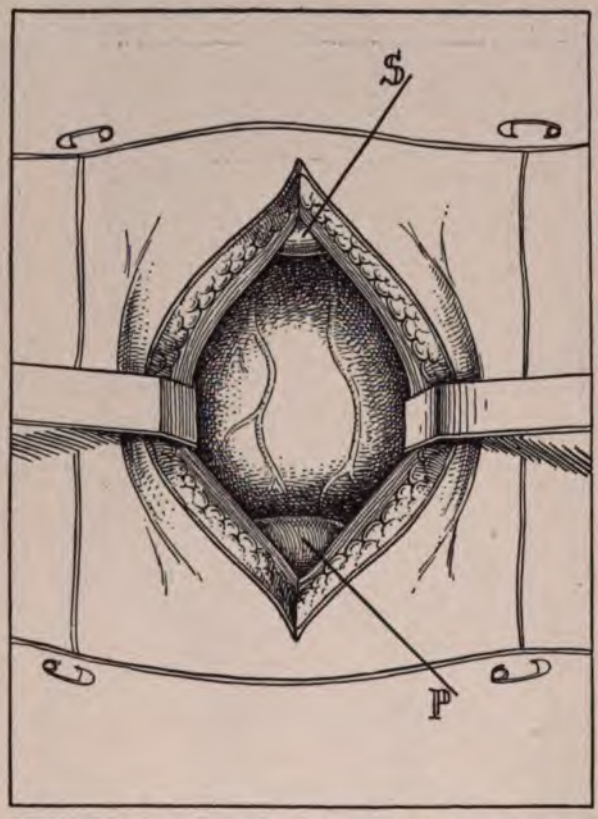


FIG. 528.—SUPRAPUBIC CYSTOTOMY. Bladder wall after the rectus abdominalis muscle has been split and the peritoneal fold pressed up. *S*, symphysis pubis; *P*, peritoneum.

**Suprapubic Operation for the Removal of Tumors.**—The patient is lowered to the half Trendelenburg position, in which position I prefer to do my work in the interior of the bladder in most cases.

The rectal bag should now be emptied by removing the clamp and allowing it to collapse in the rectum, after which it can be removed or allowed to remain as the operator prefers. In all operations on the bladder, it is advisable to keep a gauze pad in the most dependent portion of the bladder to soak up the urine, blood and solutions which otherwise might obscure the operator's field. This should be changed from time to time.

The cases of tumor are the most difficult that we have to operate upon. It is sometimes difficult to see the tumors when we first open the bladder on account of the gush of blood, and perhaps afterwards on account of the continuous bleeding. The operator should be prepared to stop this hemorrhage if

possible, in order to have a better view of the operative field; usually very hot water, as hot as the hand can bear, 120° to 130° F. or over, should be poured in. This is generally sufficient to stop the hemorrhage; if not, peroxid of hydrogen should be introduced. If this also fails, then a preparation of adrenalin is used, composed of one part of 1 : 1,000 solution in nine parts of water. The introduction of hot water frequently has a double effect—it stops the hemorrhage, and, in cases of thin, pedunculated tumors with flagellæ, it may shrink them up to such a degree that they cannot be seen. It must be remembered that tumors will not bleed in proportion to their size. I have had a tumor the size of a pea which caused more hemorrhage than others the size of an egg or even the size of an orange.

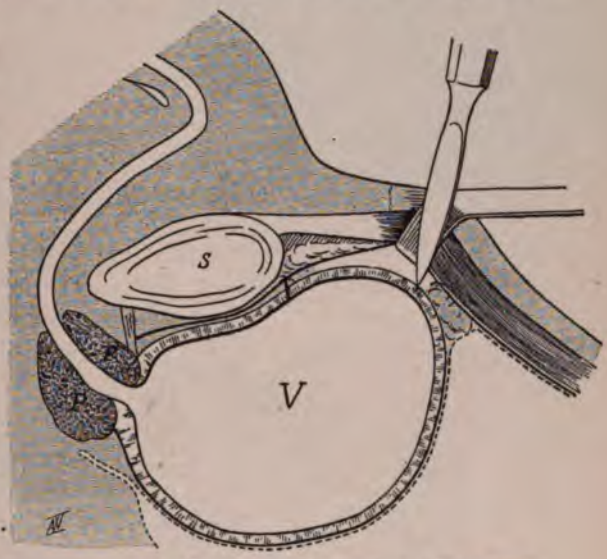


FIG. 529.—SUPRAPUBIC CYSTOTOMY. Incision made through the bladder wall from the peritoneal fold down to the pubes. *V*, vesical cavity.

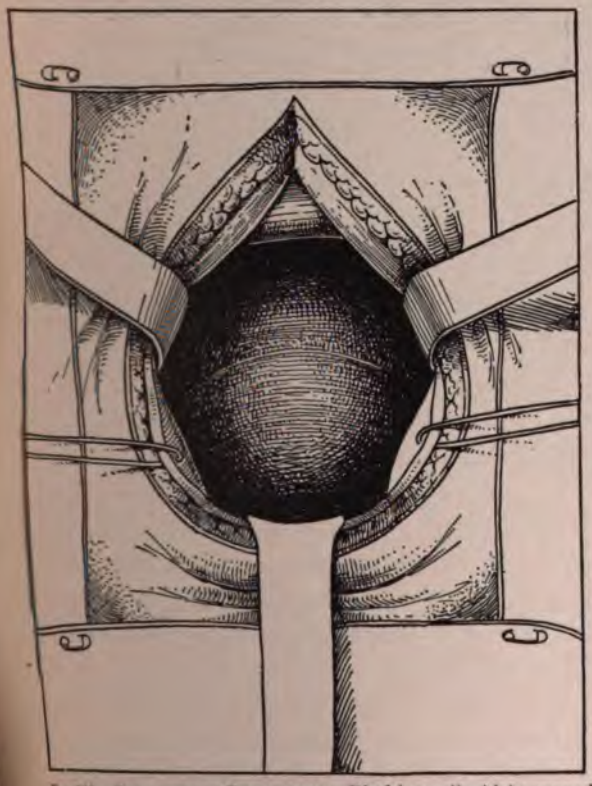

FIG. 530.—SUPRAPUBIC CYSTOTOMY. Bladder wall widely opened and the retractors in place ready for examination.

In the case of the tumor the size of a pea, just referred to, the patient was almost exsanguinated. The incision into the bladder was followed by a great gush of blood and urine. I then retracted the bladder wall on both sides and looked for the tumor, but none could be seen at first, as I had cut through a small tumor, which was followed by a gush of blood, and the tumor was then shriveled up by the hot

water poured into the bladder. I removed the tumor by two elliptical incisions, and, whereas for a long time before the operation the patient had had frequent hemorrhages, he has never had any since, and seven years have now passed.

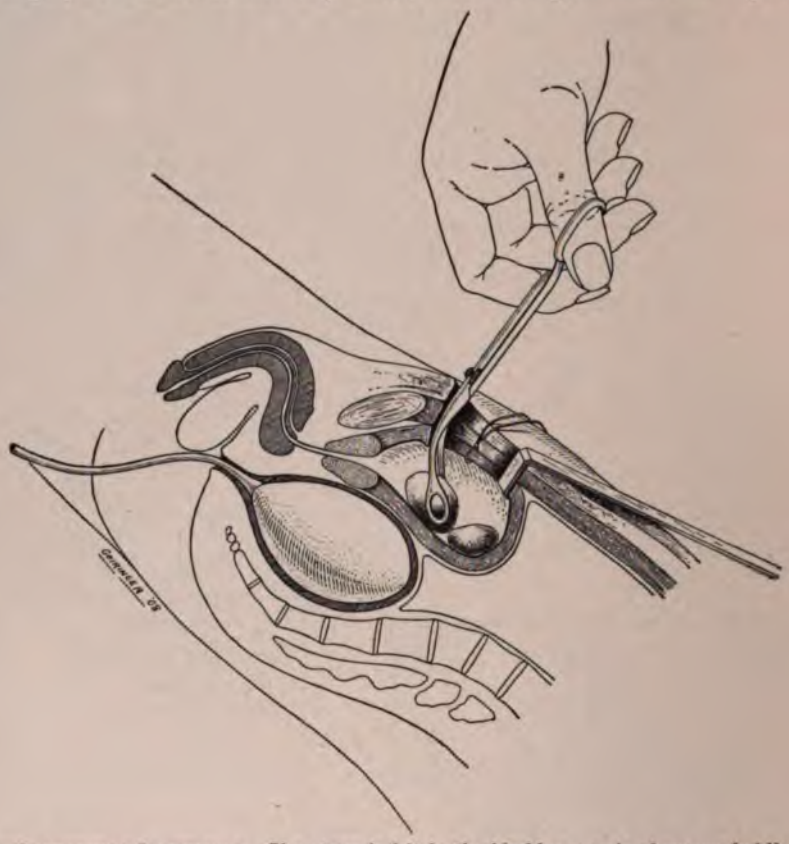

Fig. 531.—Suprapubic Lithotomy. If a stone is felt in the bladder, a pair of sponge-holding forceps is introduced and the stone grasped and removed.

After retracting the sides of the bladder with retractors or traction sutures, the tumor is often seen, as in Fig. 532. The further steps of the operation depend on whether the operator decides to remove the tumor alone or to remove a part of the bladder wall with it. It is better surgery to remove a part of the bladder wall with the tumor. Tumors can be removed in different ways: The growth can be caught by the pedicle, by means of sponge or artery forceps, or else a suture can be passed through it by which the base can be pulled up into the operative field. A purse-string suture is sometimes passed through the muscle layer around the growth, and, after the pedicle has been cut through, the purse strings are drawn and tied to stop the bleeding. The tumor can then be cut off with a pair of curved scissors and cauterized with a Paquelin cautery. Some prefer to use the cautery knife. Watson, of Boston, uses a cauterizing clamp, or a simple galvano-caustic snare, as already spoken of under

the Snaring of Tumors by Means of the Operative Cystoscope. If the tumor is sessile, it is better to remove its base in the bladder wall at the same time. But in case this is not done, its base can be destroyed by cautery, following curetting or not, as the surgeon prefers.

Personally, I have had excellent results by using a cauterizing knife, which I attach to the street current (Fig. 533). I have had cases where there have been a large number of carcinomatous growths, the size of a finger tip, in the bladder, and I have generally removed them by the cautery knife without hemorrhage. It is interesting to note that, in one case in which forty or fifty small growths were present, a surgeon from out of town, who was interested in the case, asked why I did not remove the tumors with scissors or knife, and cauterize the base. I told him it was because I thought there would be more hemorrhage; to which he replied, that in his experience there had been less

FIG. 532.—BLADDER TUMOR. (Albarran.)

hemorrhage in that way than in the other. I accordingly removed one of them by the way he suggested, and found the hemorrhage much more difficult to control. In fact, it was the only growth from which I had any hemorrhage.

Formerly, I frequently clamped growths quickly, cut them away and cauterized the base; but the operation was often accompanied by loss of blood. Some ligate the pedicle, which also seems to me to be bad practice. I have at times left clamps on a bleeding pedicle in the case of a weak patient for twenty-four hours or longer, but I cannot recommend it except in the case of an emer-

gency. The best way to remove a tumor without taking a section of the entire bladder wall with it is to make two elliptical incisions about the clamp, and to sew up the incision as the tumor is being removed (Fig. 534). This is best performed on tumors of the anterior or lateral walls.

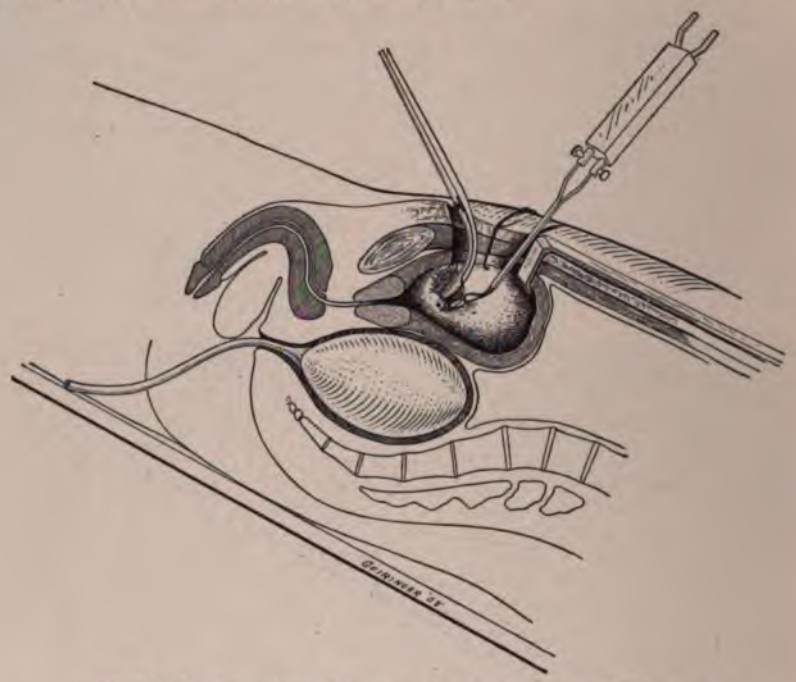

FIG. 533.—SUPRAPUBIC OPERATION FOR REMOVAL OF TUMORS.
The clamped tumor removed by a cautery knife connected with the street current.

**Suprapubic Cystotomy for Drainage in Vesical Tuberculosis.**—This has been advocated as an operative measure for treating tuberculosis of the bladder and other vesical troubles. It consists in opening the bladder in the manner already mentioned and inserting a tube for drainage for an indefinite period. When I first began to operate to relieve painful bladder conditions, I performed a few such operations, all of which were unsuccessful and many followed by fistula. As I look back upon them I believe that the patients were all worse after than before the cystotomy. I can therefore only condemn it.

**Suprapubic Cystotomy for Drainage in Prostatic Hypertrophy.**—Suprapubic cystotomy for drainage was also employed in the treatment of hypertrophy of the prostate gland in cases in which a considerable amount of residual urine was present in patients who did not tolerate catheterization well and who had occasional attacks of urethral (catheter) fever or epididymitis as a result. This method is scarcely ever used at present, since the technique of prostatectomy has been so much improved and the mortality correspondingly lowered. For further consideration of this subject see the chapter on Prostatic Hypertrophy

**Suprapubic Prostatectomy and Prostatotomy.**—Suprapubic cystotomy as step to prostatectomy is performed to enable the surgeon to enter the bladder nd enucleate the prostate in which case the operation is termed suprapubic

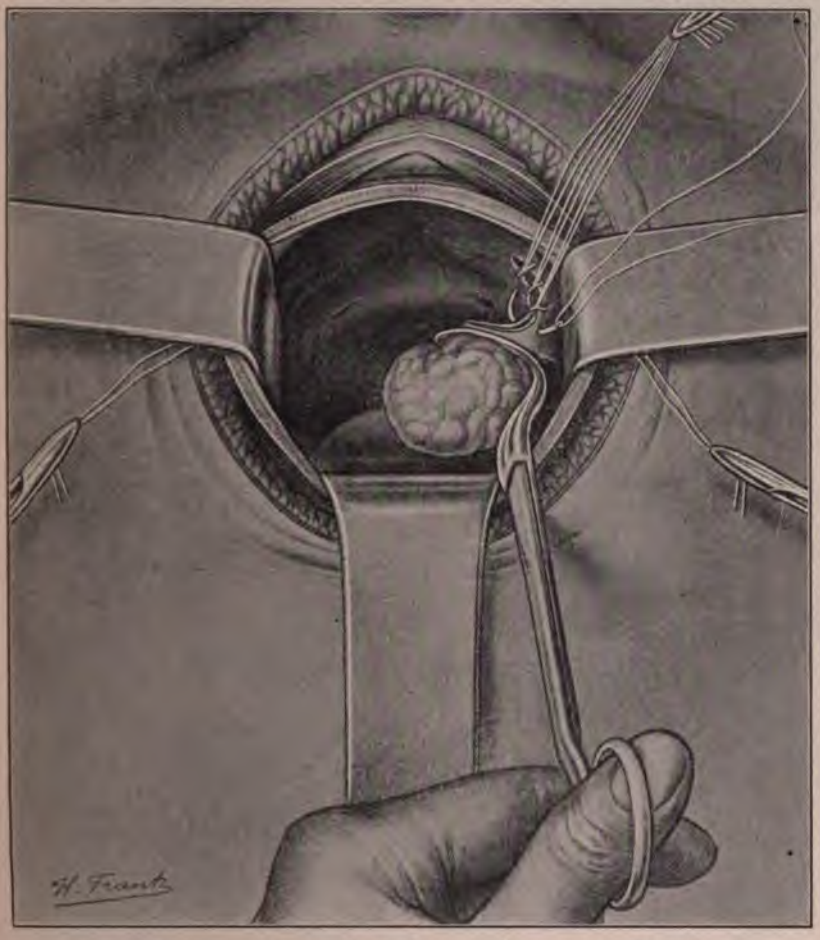

FIG. 534.—SUPRAPUBIC OPERATION FOR REMOVAL OF TUMORS.
The clamped tumor being removed, while the line of the incision is being sutured. (Albarran.)

prostatectomy. If it is performed for removal of calculi from the prostate gland, it is called suprapubic prostatotomy. (See chapter on Prostatic Calculi.)

**Suprapubic Cystotomy for Formation of a Valve.**—Suprapubic cystotomy for the formation of a valve through which a catheter can be passed is also performed in cases of inoperable growths of the prostate, or in any other condition in which an aperture for permanent drainage without leakage is required in patients with an inoperable obstructed urethra. This valve arrangement, which was first introduced into bladder work by Gibson, consists simply in opening the bladder, inserting a tube and sewing up the sides about the tube

by two or three rows of Lembert's sutures, thus inverting this portion of the bladder. After the walls have healed about the tube in this position, it is withdrawn. The inverted adjacent sides of the bladder press against one another and prevent the escape of urine by the valve whenever an effort is made by the wall of the bladder to expel urine. On the other hand, a catheter can be passed through the valve to empty the bladder whenever it is necessary. This operation is described more fully with illustrations under Malignant Growths of the Prostate, in which class of cases I have used it.

## IV. PARTIAL CYSTECTOMY

The trend of operative work in cases of tumor of the bladder seems to be the removal of a part of the bladder wall with the base of the growth. This is easy when the growth is situated in the upper zone of the bladder, especially when it lies on the front wall; but when it is situated in the posterior part near the base, it is more difficult.

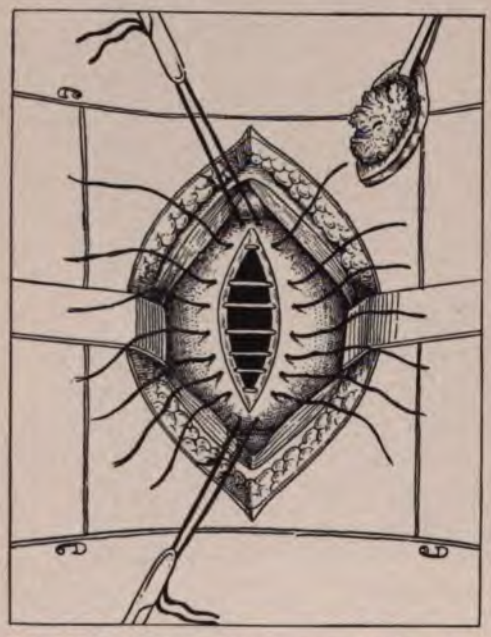

Fig. 535. — Partial Cystectomy. Section of the bladder wall with the tumor removed by two elliptical incisions. This can be either extra- or intraperitoneal. In this figure it is extraperitoneal.

In performing partial cystectomy, the bladder can be exposed in the manner already described. The peritoneum can sometimes be pushed up sufficiently over the sides and roof of the bladder for exposing and removing the seminal vesicles, and it will thus be seen that we can at times obtain the required bladder exposure for the removal of a tumor and the surrounding bladder wall in cases which are well defined and do not involve too much bladder tissue. When, however, they infiltrate a large part of the bladder wall, and well-marked pericystitis is present there is usually great difficulty in removing the peritoneum from the base of the growth.

The tumor having been located by the cystoscope and through the vesical incision, the bladder wall can be picked up above and below it and two elliptical incisions can be made through the entire wall at a sufficient distance from the side of the tumor to strike healthy tissue. After the bladder wall has been cut through by these two incisions and the section including the tumor removed

the two sides can be united, either by the Lembert or Cushing sutures or sometimes the ordinary interrupted approximating suture (Fig. 535).

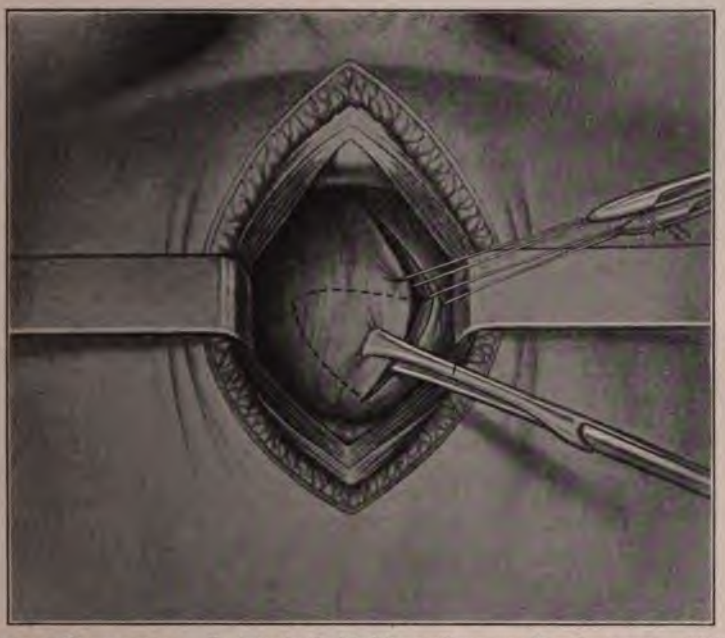

Fig. 536.—Partial Cystectomy. Incision in the bladder wall surrounding the tumor. (After Albarran.)

Fig. 537.—Partial Cystectomy. Piece of the bladder wall, including the tumor, excised, and the sutures passed for closing the gap. (Albarran.)

In performing such an operation, if the peritoneum has been strip back from the seat of the incision, it can be pulled down over it again a

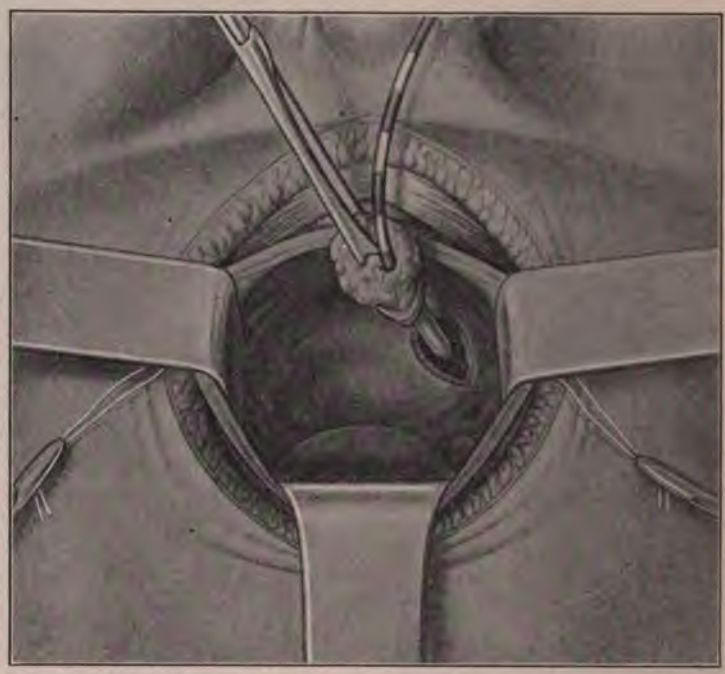

FIG. 538.—PARTIAL CYSTECTOMY. Ureter and the growth removed *en masse*. (After Albarran

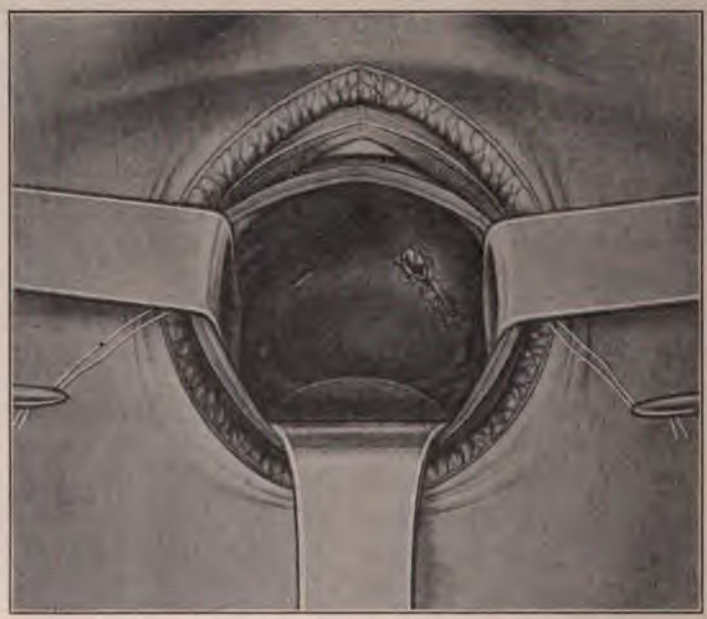

FIG. 539.—PARTIAL CYSTECTOMY.
Stump of the ureter sutured to the sides of the bladder incision. (After Albarran.)

the operation has been completed. A drain is left down to the bladder wall.

**Intraperitoneal Cystectomy.**—If the bladder wall over the tumor has a serous layer, after opening the peritoneal cavity, it is picked up above and below the growth, the field of operation walled off, the elliptical incisions made, the tumor and the adjacent bladder wall removed and the wound closed by Lembert sutures, as just described. Drainage need not be used if the urine and bladder are aseptic. Firm union takes place when the serous layer is included (Fig. 535). If the tumor is irregular in shape, it is only necessary to make an ellip-

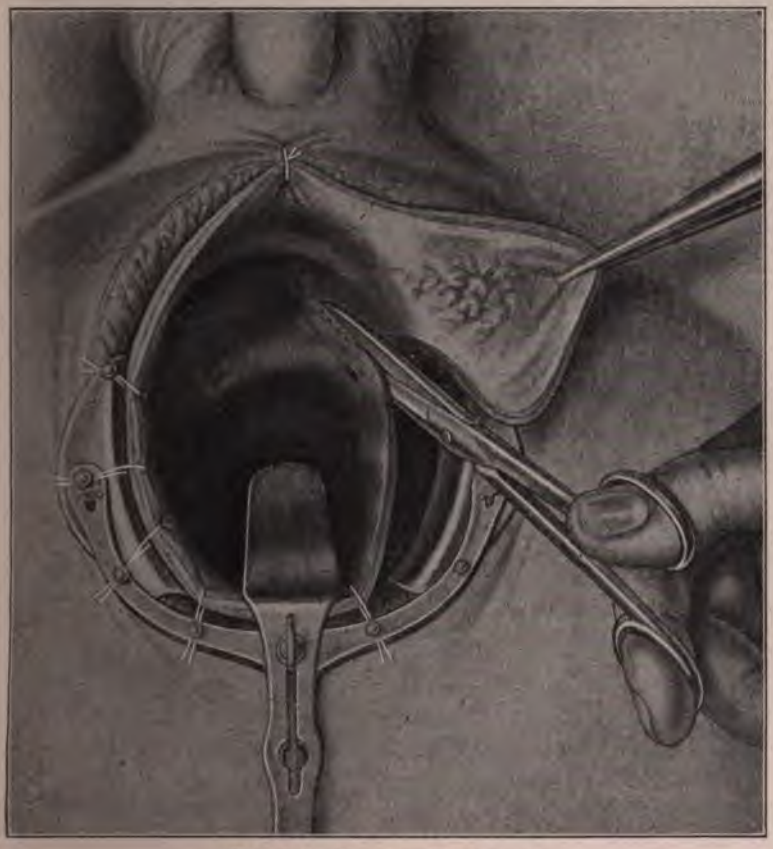

FIG. 540.—PARTIAL CYSTECTOMY.
Manner of cutting away a large area of the bladder wall with scissors. (From Legueu.)

tical incision on one side of the growth and incisions radiating off from it in such a way as to remove the tumor with a portion of the bladder wall on all sides of it (Fig. 536). The piece of bladder wall with the tumor attached is then removed and the edges of the incision are united (Fig. 537).

In case the tumor is situated in the base of the bladder near the ureter, a catheter is introduced into the ureteral canal; two elliptical incisions are then

made on either side of the ureter sufficiently deep to liberate the ureter and the adjoining bladder tissue; the ureter and the growth are removed at the same time *en masse* (Fig. 538). After this, the ureter can be separated from the diseased mass and planted in the bladder wall and stitched in place (Fig. 539).

**Extensive Partial Resection of the Bladder Wall.**—It has heretofore been considered that only tumors of the anterior part of the bladder wall could be excised; but Legueu has shown that a large part of the anterior lateral and posterior wall can also be removed. In performing such an operation, the peritoneum should be pushed up from the bladder as much as possible; a double retractor is introduced into the bladder through the median incision and the sides of the upper half of the bladder incision are attached to the retractor by ligatures; while the lower angle of the bladder is made fast to the integument at the lower angle of the skin wound. The portion of the bladder to be excised is then marked out on the affected side and the incision can begin at the upper part of the edge of the bladder and can extend downward, if necessary, so as just to graze the ureteral attachment almost to the bladder sphincter, from which point it can be brought up to any part of the edge of the median incision that is indicated. The bladder wall over this area can then be cut away with scissors (Fig. 540). It can be seen that in this way, a large piece, even about half of the bladder wall can be cut away (Fig. 541). The cut margins of the remainder of the bladder should then be united by through-and-through sutures of plain catgut, after which it should be reënforced with a chromic-gut Lembert suture. The drainage and after-treatment are the same as after any bladder operation.

FIG. 541.—PARTIAL CYSTECTOMY. Nearly half the bladder removed by partial excision of the vesical wall. (From Legueu.)

**Closing of the Incision after a Suprapubic Operation.**—A single large catheter, No. 35 French scale, or two smaller ones, No. 22 French, are inserted into the bladder. I prefer the former, but describe the latter for detail's sake.

They are attached to the bladder wall by plain catgut, the ligatures passing through the wall of the catheters as well. The bladder wall is then pulled taut by the traction suture at the upper end of the incision, and the sides of the incision are approximated by the traction sutures already passed through either side of the vesical incision. Sutures (No. 2 chromic) are then passed through the vesical wall about a quarter of an inch apart, uniting the two sides of the

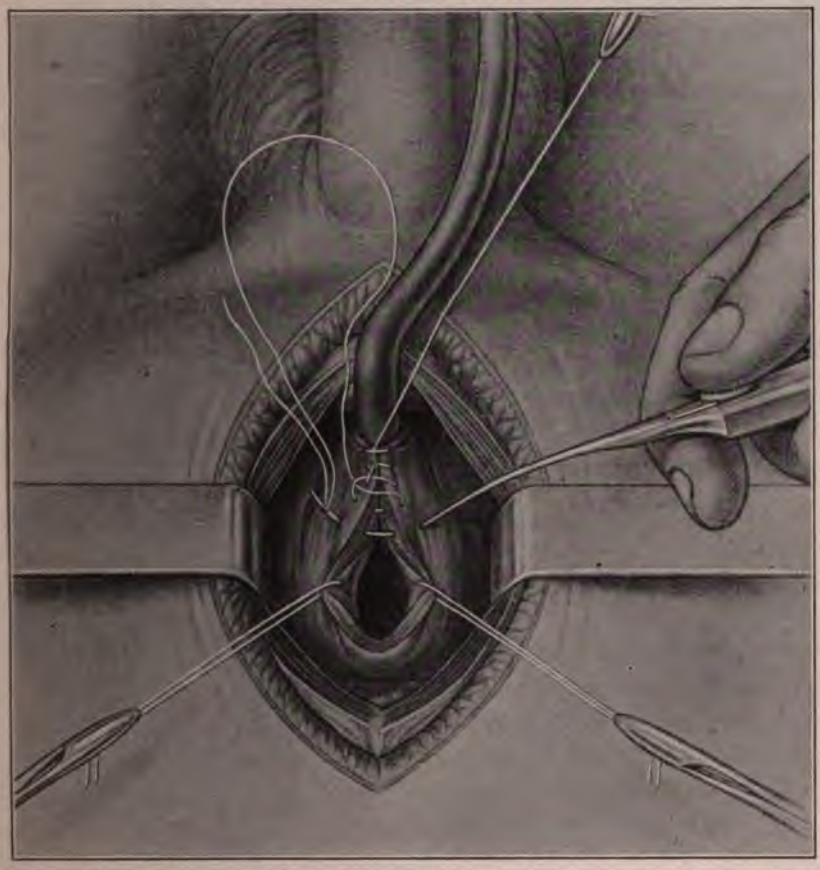

FIG. 542.—SUPRAPUBIC CYSTOTOMY: CLOSING THE BLADDER WALL. Showing the suprapubic bladder drainage tube in the bladder, and the uniting of the wall above it by means of a continuous suture. (After Albarran.)

incision down to the tubes (Fig. 542). After this, the traction sutures are withdrawn. The sutures in the bladder wall go through the outer coats, but not the mucous membrane; for, if they did, the suture would be exposed to the urine of the bladder and urinary salts would be deposited upon it and would act as the nucleus of a calculi. I have had two cases in which the calculus was formed on sutures that had been passed through the mucous membrane in former operations on the bladder.

After the bladder wall has been closed, a small gauze drain should be in-

serted beside the lower tubes down to the bladder incision, above and below them. The fascia over the rectus muscle is then sewed together down to these tubes either by continuous or interrupted sutures, using No. 3 chromic catgut. The skin is then sewed together with No. 3 plain gut in the same way.

After the abdominal wound has been closed down to the drainage tubes, I pass No. 1 chromic sutures through the skin and the tubes to aid those of plain gut attached to the bladder wall in keeping them in place and thus favor the siphon drainage.

The abdominal dressing is then put on. This consists of some small pieces of gauze about the tube and then a large combined dressing of gauze and absorbent cotton about 9 by 12 inches in size. A hole is made in the middle of this, or a cut from the side up to the middle, to allow the passage of the two drainage tubes.

This thick combined dressing soaks up the urine escaping from the sides of the tubes and prevents the general wetting of the bed and patient. It is held in place by two rather wide strips of adhesive plaster, one of which extends from just over the trochanter on either side and over the pubes in the middle, and the other, which is wider, is placed from two to three inches above the lower one. These combined dressings, which are very thick, must be changed from time to time, depending upon the rapidity with which they become soaked with urine. When the strips of plaster are cut through in the center at the time the first dressing is changed, pieces of tape are attached to the cut ends to facilitate the changing of the future dressings. It is then simply necessary to untie the tapes, lift off the urine-soaked dressing, put a dry one in its place and tie the tapes over it. This does away with the constant changing of the strips of adhesive plaster, which tends to give rise to an artificial eczema and excoriation of the epidermis.

The loose gauze dressing next to the wound is changed at the same time o but twice a day. Sometimes shaken or fluff gauze is used instead of the com bined dressing. Each time a combined dressing is changed, an opening mu be made for the passing of the drainage tubes. A binder is now placed aroun the patient and pinned in the front, allowing sufficient space for the passage the drainage tubes. The frequency of the changing of the binder tends to di place the tubes and I now rarely use it.

The drainage of the bladder is by siphonage. It is instituted immediate after the operation. Glass tubes about six inches in length and one half or o quarter of an inch in diameter are now placed in the free ends of the blad drainage tubes. Their other ends are attached to longer pieces of rubber tubi which extend over the edge of the bed into a half-gallon bottle tied to the s of the bed. The ends of the tubes should reach to the bottom of the bottle bel the surface of the solution to prevent air from entering (Fig. 543). A p of carbolic-acid solution is kept in this bottle. There is a tendency for

drainage tube to drag and consequently for the ends of the tubes in the bladder to be pulled out unless some provision is made for supporting the tubes. This can be done by placing a large ring three or four inches in diameter about the bladder tubes, and then allowing them to hang loosely below this by supporting the tubes below the glass tubing with safety pins attached to the sheets. Sometimes the tubes are supported by rolled-up bath towels. This attachment for drainage is the simplest that there is, although rather difficult to describe. After it has been arranged, the lower ends of the tubes are held up and filled with water from below and then suddenly brought down with their ends pinched and thrust into the drainage bottle. This tends to establish the siphon drainage.

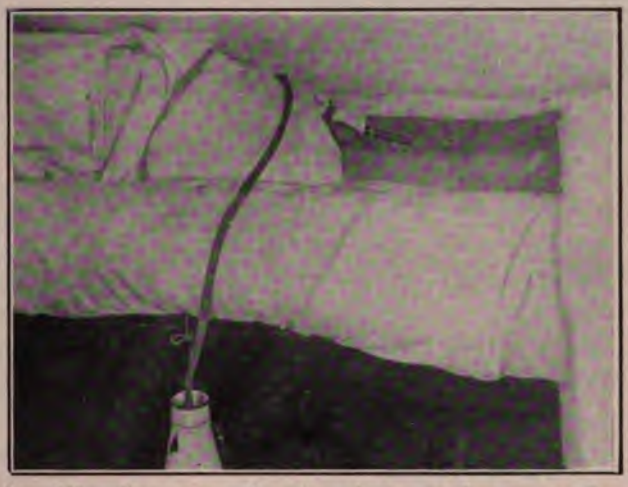

FIG. 543. — SUPRAPUBIC DRAINAGE OVER THE SIDE OF THE BED INTO A BOTTLE.

It may siphon but a short time, however, and then one or both tubes may become occluded. This is discerned by the patient complaining of abdominal pain and distress, or by the dressing suddenly becoming soaked. It is always wise to examine the glass tubes from time to time, as the presence of urine in them shows that drainage is taking place and the color of the urine shows whether or not much blood is mixed with it. If one of the tubes is found not to be draining well, it is probably clogged by a blood clot or else bent, and the tubes should be adjusted and then stripped, or aspirated, or injected by a piston syringe.

Stripping the tube reëstablishes the flow by exhausting the air and consequently sucking out the clot, if present. It consists in taking the lower tube below the glass coupling in the left hand without taking it out of the fluid, carefully steadying it and then pulling the compressed fingers of the right hand downward over the tube to a lower part; then holding the tube compressed by the left hand at the lower point reached by the fingers of the right hand and again stripping it down. In this way the flow is often entirely reëstablished. The upper hand must so steady the tube that the lower hand will not pull it away from the bladder in stripping it.

If the flow is not reëstablished in this way, as is noted when no urine appears in the glass tubes, the end of the lower piece of rubber tubing should be taken out of the bottle, and the nozzle of a large piston syringe inserted into it,

after which the piston is drawn back and an attempt made to aspirate the obstruction in this way. In case this fails, then the syringe is filled with warm salt solution, which is injected into the tube a little at a time and allowed to run out again in an effort to dislodge a probable clot. Generally, by these methods, drainage is quickly reëstablished, although it is never wise shortly after an operation to work much on one tube in case the other is working well, and if I fail by simply stripping the tube to reëstablish the flow in the clogged tube and the other is draining well, I generally do nothing until the first dressing. In fact, this may be a good rule to follow even in cases in which both tubes are occluded; for as long as there is no abdominal distention and distress, and the urine is leaking freely into the dressings along the tube, nothing can happen excepting to give the patient some rise of temperature and somewhat more discomfort, and it must be remembered that the degree of inconvenience is always great under the most favorable circumstances.

The first dressing other than the removal of the urine-soaked gauze and cotton generally takes place on the morning following the operation and there is rarely any necessity of interfering with the tubes before this, unless there has been carelessness in the handling of the patient. The carelessness consists of the attendant pulling on the tubes when lifting the patient from the table to the stretcher or from the stretcher to the bed, and also loosening of the tubes by pulling blankets and sheets from underneath the patient. It is important to see after the patient is in bed and the siphon drainage arranged, that he is not rolled over on his side to allow him to vomit more easily, and in this way dislodge the tubes.

At the time of the first dressing, everything is removed from the wound the bladder-drainage tubes uncoupled from the glass tube and the bladde washed out with boric-acid solution injected by means of a fountain or pisto syringe, the former preferred, until the fluid escapes clear. The same kind o dressings are then put on as at the time of operation. If there is much redne on the line of incision, a strip of gauze soaked in 1 : 1,000 bichlorid solution ca be applied. The dressings should be changed and the lavage of the bladd again given in the afternoon or evening.

On the following morning, the second day after the operation, the patient again dressed and the bladder washed out with boric solution and then w a 1 : 2,000 solution of nitrate of silver. If the drainage has been satisfacto as usually happens, the lower tube and the small gauze drain inserted at time of the operation are removed and a small cigarette drain is passed do beside the remaining tube to the bladder wall.

The same treatment is continued until the fourth day after operation, w the second tube is withdrawn, a small piece of a No. 15 French catheter serted into the bladder and a cigarette drain down from the bladder wall. there is any separation of the sides of the skin incision, they should be strapp

with narrow strips of diachylon plaster (Fig. 544). The same large protective combined dressing is still employed and the patient can be placed in a reclining position in an easy chair with his feet elevated. Two days later, or six days after the operation, a piece of No. 10 catheter is substituted for the No. 15, and again two days later, eight days after the operation, the piece of No. 10 catheter can be removed and the patient can walk about the room. A small cigarette drain should be kept in the wound down to the bladder wall to prevent the abdominal wall from uniting before the bladder wall does so. Two days later, or ten days after the operation, the cigarette drain should be removed.

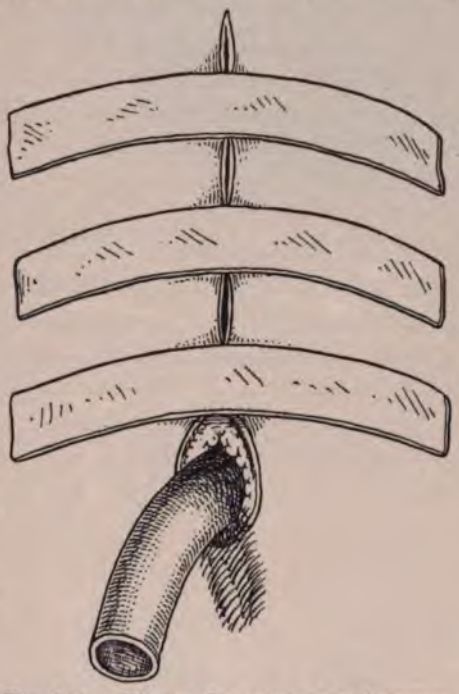

Fig. 544. — Wound Strapped with Surgical Plaster.

If there is much leakage from the bladder wound, insert a soft-rubber catheter, No. 18, through the urethra into the bladder, to be retained, and allow the patient to walk about with its end in a urinal between his legs. (See Fig. 153, Vol. I.) This drains the bladder by a continuous flow at first and after two or three days it is plugged and the plug withdrawn every one to three hours to allow the urine to escape. When the patient is in bed, he keeps the urinal between his legs.

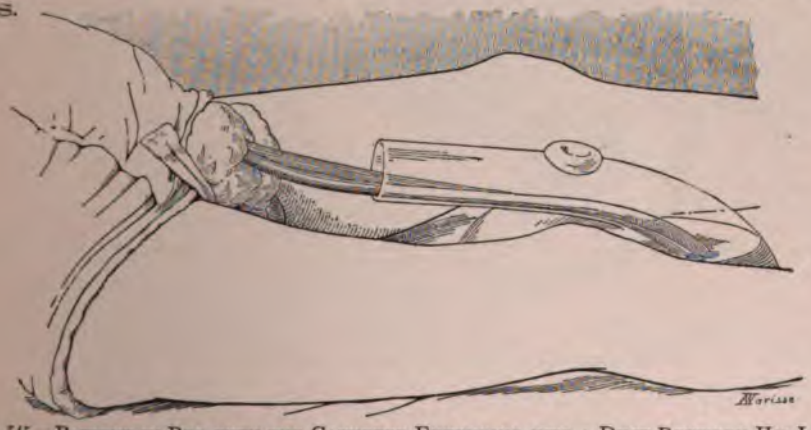

Fig. 545.—Patient in Bed with the Catheter Extending into a Duct Between His Legs. (After Hartman.)

There are numerous excellent methods of draining the suprapubic wound which keep it quite dry, the best of which are those of Blassuci and Dawbarn

of New York; but my results have been so satisfactory, owing to the careful nursing of the patients, that I have not deemed it necessary to adopt these.

There are certain disagreeable symptoms that sometimes follow suprapubic cystotomies, such as vomiting and hiccough and tympanites, all of which have been considered in the chapter on Suprapubic Prostatectomy, as complications are more apt to occur after a suprapubic cystotomy for the removal of the prostate than for any condition in the bladder proper.

## V. PERINEAL CYSTOTOMY

A perineal urethrotomy consists in making an incision through the perineum in the median line into the bulbous urethra or that part of the canal just behind the bulb, with the object of opening or working on the urethra. When, however, such an incision is made for an operation in the bladder, it is called a *perineal cystotomy.* If it is done for operating on the prostate through the urethra, to evacuate a prostatic abscess or to remove a prostatic calculus, it is called *perineal prostatotomy.* When it is made for the purpose of removing the gland it is called a *perineal prostatectomy.* In this chapter we will consider simple perineal cystotomy, that is, the opening of the perineal urethra for the purpose of working in the bladder cavity.

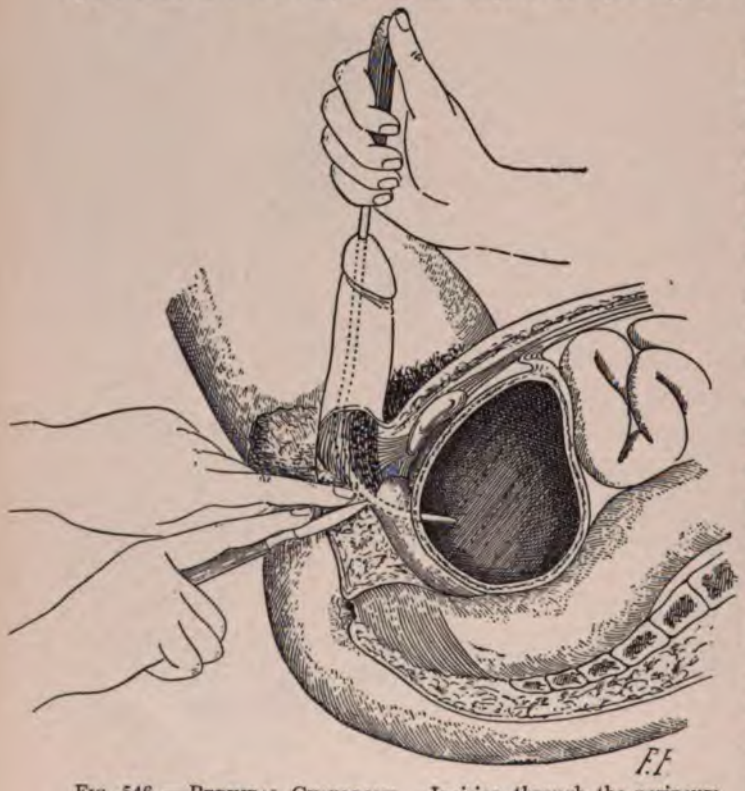


FIG. 546. — PERINEAL CYSTOTOMY. Incision through the perineum into the perineal urethra, from which point the finger can be passed into the bladder.

**Technique of Perineal Cystotomy.**—In performing the operation of perineal cystotomy, the patient is placed flat on the back on the operating table after which a metallic guide is passed through the urethra into the bladder. The patient is then pulled down until his buttocks are on the edge of the table

His feet are placed in lithotomy holders, or a *Clover's clutch* is placed about his knees, which are drawn up and held flexed and separated from one another by means of a strap going around the patient's neck and a sliding extender between the knee straps. The patient's perineum is then well exposed.

The operator sits facing the patient's buttocks, an incision is made in the median line just behind the scrotum down to within three quarters of an inch of the anus. The superficial fascia is cut through, the bulb of the urethra is exposed and is caught by a tenaculum or by a small two-bladed retractor and held up while the tissues below the bulb are pushed from it with the handle of a knife. These tissues are usually fatty. The urethra is then exposed, and, if not, the guide can be felt by the finger pushed into the perineum at this point. The point of the knife is then inserted through the urethral wall into the groove in the guide and the urethra is opened (Fig. 546). After this, a grooved director is passed through the incision along the urethral guide into the bladder. The urethral guide is then withdrawn, leaving the grooved director in the bladder, and the opening into the bladder is made larger by running a knife along the director, enlarging the incision. The forefinger is then pushed along the grooved director through the incision and the prostatic urethra into the bladder. It is possible to palpate the ordinary collapsed bladder with the forefinger of one hand in its cavity and the fingers of the other hand over the pubes pressing down upon it, or having one or two fingers of the other hand in the rectum.

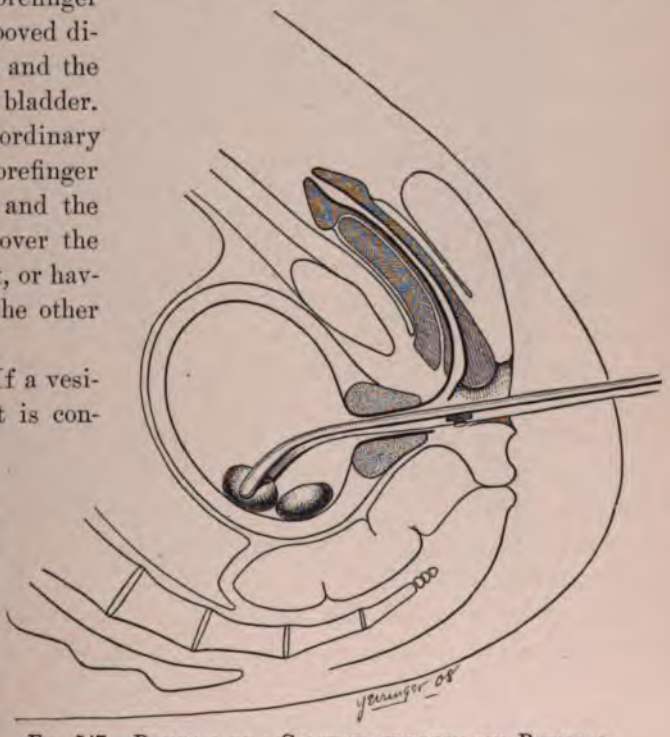

Fig. 547.—Removal of a Calculus through the Perineal Opening.

**Perineal Lithotomy.**—If a vesical calculus is present that is considered too large to be delivered through the bladder sphincter, the prostatic urethra and the perineal opening, the passage can be still further dilated by the fingers or dilators. A pair of forceps, either special stone forceps or an ordinary pair of sponge forceps, should then be introduced into the bladder, the stone grasped and pulled down by gentle traction through the prostatic portion of the canal and the perineal

incision (Fig. 547). I have in this way delivered smooth stones, seven eighths of an inch in the broadest diameter (Fig. 548), and, in a child of eleven years, a stone measuring two thirds by four fifths of an inch in diameter. If the stones are rough, as in the case of mulberry calculus, considerable laceration of the tissues might take place and it would not be considered wise to remove them when of such dimensions. In case the stone is found to be too large to be withdrawn in this way, as is shown by the amount of resistance offered, a lithotrite can be passed through the perineal opening into the bladder, the stone grasped and crushed and then the fragments either withdrawn by forceps or pulled out by a dull curette. It is not advisable to attempt to remove a stone by the perineal route that has to be crushed on account of its size, but rather to use the operation of suprapubic lithotomy. It is, therefore, advisable before the operation of vesical lithotomy always to determine by a cystoscopic examination, as well as by recto-abdominal palpation, the size of the calculus, in order to judge whether a suprapubic or perineal lithotomy should be performed. A perineal lithotomy is much simpler and much less dangerous than a suprapubic one. In the majority of cases that I operate upon, the calculi can be removed by the first-named route. If these operations are not followed by laceration of the tissues, they heal very quickly, the patient frequently leaving the hospital ten days after the operation, with the wound completely closed. In case there is danger of tearing or wounding the sphincter, however, the attempt should never be made, as it is liable to bring on incontinence of urine from which he may never recover.

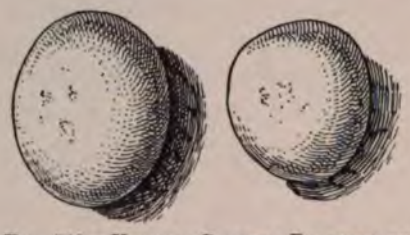

Fig. 548.—Vesical Calculi Removed by Perineal Csytotomy in a Full-grown Man. (¾ actual size.) (Author's case.)

**Tumors of the bladder** were formerly removed by means of instruments or the finger inserted into the bladder through a perineal cystotomy incision, but with a better knowledge of bladder surgery these methods are not considered scientific, and the results are more satisfactory when the operation is performed by the operating cystoscope, by suprapubic cystotomy or by fulguration.

**After-Treatment in Perineal Cystotomy.**—After the perineal cystotomy, a perineal catheter, from 30 to 35 French in size, should be passed through the perineal incision into the bladder and fastened in place; the bladder should be washed out through the tube twice a day, once with boric-acid solution and the second time with a solution of nitrate of silver (1 : 2,000). At the end of two days, the tube can be removed and a simple perineal dressing applied. The patient is instructed to stand up with his thighs brought together and to press a piece of gauze with his fingers against the perineal wound when voiding. The wound heals quickly. The internal treatment is to drink three quarts of water a day and to take ten grains of urotropin three times a day.

## VI. COLPOCYSTOTOMY

This operation consists in opening the bladder by means of an incision in the anterior vaginal wall.

The patient is placed in the gynecological position. An Edebohls speculum is placed in the vagina. A grooved sound is passed into the bladder through the urethra and the vagina is held open by side retractors. A vertical incision is made through the anterior vaginal wall into the groove of the sound in the bladder (Fig. 549). The sides of the incision are caught by bullet forceps and held apart while the finger is inserted through the opening into the bladder.

Fig. 549.—Position of the Patient and the Incision in Colpocystotomy. (Albarran.)

The vesical cavity is palpated carefully and a calculus too large to be removed by the urethra can be withdrawn through the opening. Tumors situated in this part of the posterior bladder wall can also be removed by this route. The operation is also performed for bladder drainage. The closing of the wound consists in trimming the sides of the incision as in a case of vesicovaginal fistula and uniting the two edges with No. 2 chromic catgut, care being taken not to pass the needle through mucous membrane of bladder. A soft-

rubber catheter is passed into the bladder through the urethra after
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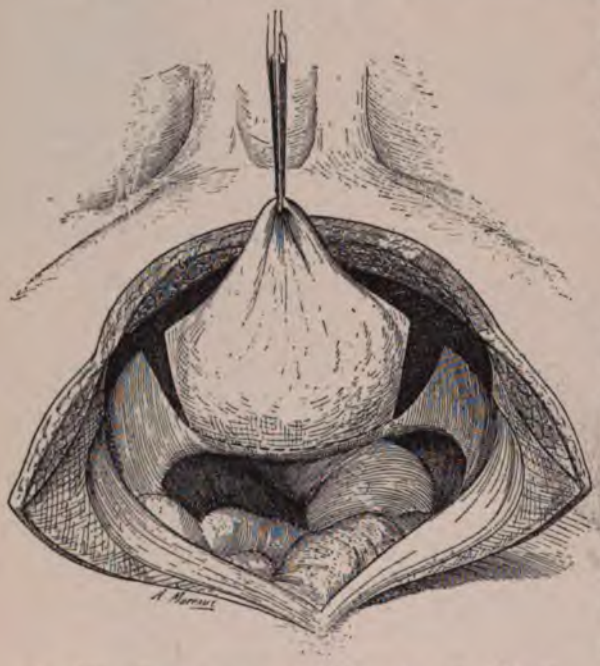

FIG. 550.—EXTIRPATION OF THE BLADDER. Showing the line of incision through the peritoneal covering of the bladder and its sides. (From Pierre Duval.)

## VII. TOTAL EXTIR OF THE BLAD

This operation ca
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through the transverse
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introduced into the bla
the incision through
dominal wall is ma
bladder is exposed
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peritoneum is pushe

far as possible. The vesical wall is then grasped at this point by bullet forceps and pulled forward, and a continuation of the pushing back of the peritoneum is resorted to with the finger tips or by wiping it back with gauze. Sometimes the peritoneum can be pushed back as far as the vesico-rectal fold behind, which is the distance required. Usually, however, the adhesions of pericystitis are encountered and the peritoneum is torn in one or more places at which it is clamped. If the adhesions

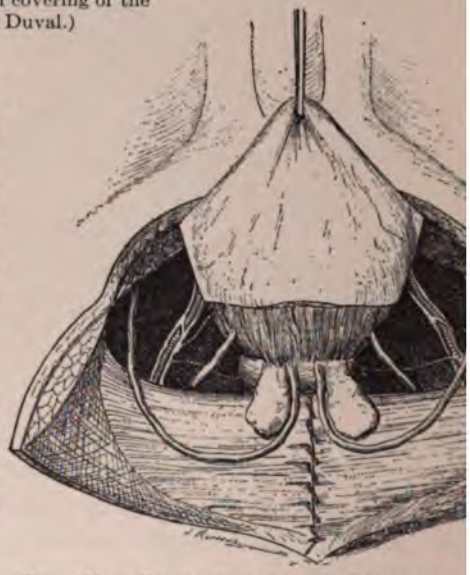


FIG. 551.—EXTIRPATION OF THE BLADDER.
vascular pedicles, ureters, seminal vesicles
crens. The peritoneum is sewed together.
val.)

are many, it is better to cut through the peritoneal wall and the part covering the bladder farther back, pull the bladder up (Fig. 550) and then expose the vascular pedicle, the ureters, the seminal vesicles and vas deferens and then unite

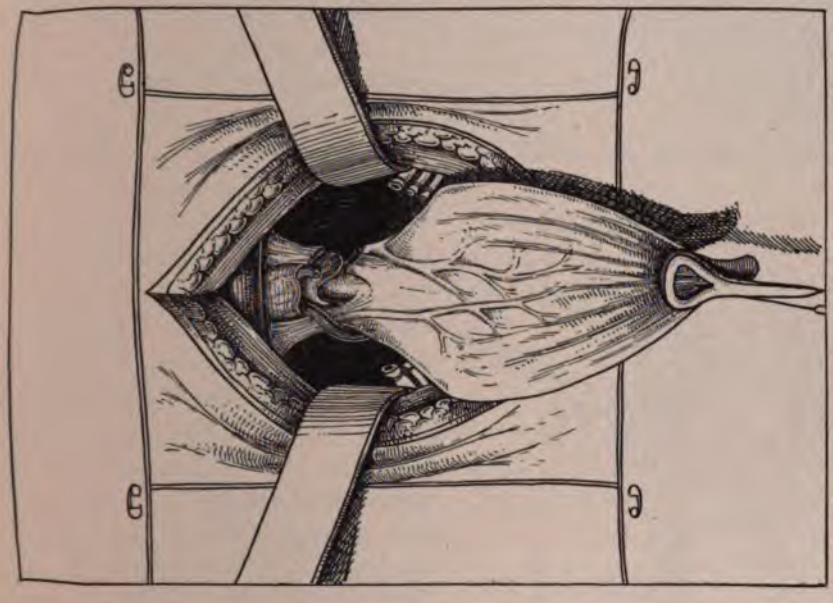


Fig. 553.—Extirpation of the Bladder. The bladder pulled back showing the pubo-vesical ligaments. The cut ends of the vascular pedicle and the ureters are seen on either side. (From Albarran.)

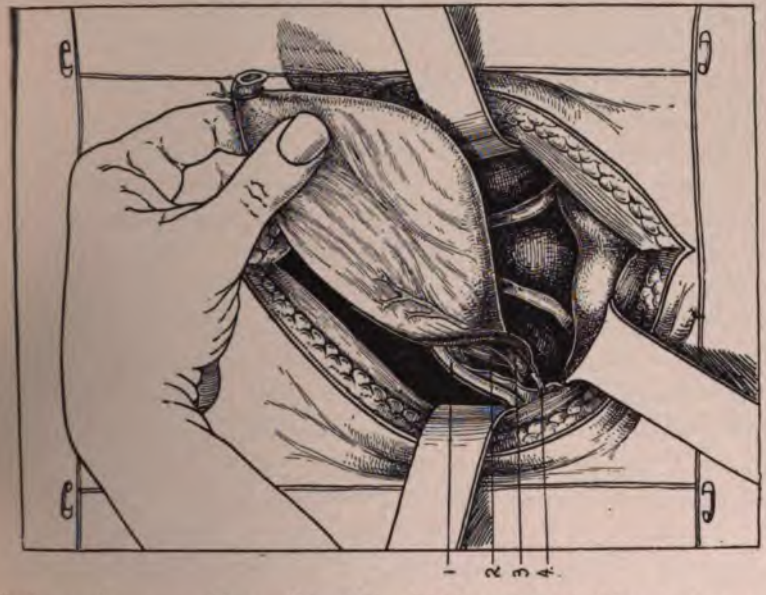



Fig. 552.—Extirpation of the Bladder. Showing the ureter, the umbilical and inferior vesical arteries and the periureteral veins. There is no peritoneum seen over the bladder in this figure. (From Albarran.)

again the peritoneum, if possible (Fig. 551). The bladder is then pulled to the right side, thus exposing better the vascular pedicle (the umbilical and inferior vesical arteries and the periureteral veins) and the ureter on the left (Fig. 552).

The blood vessels are ligated and cut through. The ureter is now c cut through and ends cauterized. The bladder is then pulled to the ot and the vessels of the right pedicle and the ureter are ligated and trea similar manner. The bladder is now pulled back from the pubes, sho pubo-vesical ligaments (Fi The neck of the bladder clamped and cut through a prostate with a thermo knife and without injuring deferens and the seminal The bladder is then remov the pelvis. Fig. 554 shows sition of the internal genit the operation. A large pe tube, No. 30 French, is the up through a perineal into the bottom of the wo a similar tube is passed wound from above in such that the ends of the tubes a each other in the vesicle lo abdominal wall is then clos ready described.

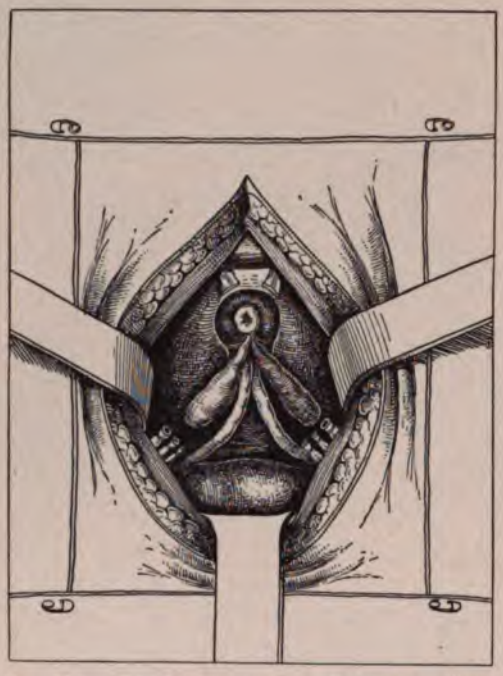


FIG. 554. — EXTIRPATION OF THE BLADDER. Showing the loge from which the bladder has been removed. (From Albarran.)

The disposition of the in this operation is the which seems to interest the o principally. Several met disposing of them have been considered. They are as follows: Making tomosis (1) with the rectum, (2) with the large intestine, (3) with the (4) with the urethra, (5) with the abdominal wound, (6) with an inc the lumbar region, (7) with an incision in the perineum and (8) ligatio ureters and double nephrostomy for drainage. The last method appeals the best one; in which case, the nephrostomies and the ligations of the should precede the cystectomy. The end results of all these anastomoti tions have been very bad. The mortality has been about sixty per cent.

# CHAPTER XLVI

## ANOMALIES AND INJURIES OF THE PROSTATE

**Anatomy.**—The prostate is a deep-seated gland composed of two lateral lobes, the anatomy of which has alrady been discussed in the first volume of this work. It is shaped like a horse chestnut and is about one and one half inches wide, one and one quarter inches in its vertical diameter and three quarters of an inch in its antero-posterior diameter. The neck of the bladder fits into its base and the first part of the urethra, called the posterior or prostatic portion, passes through it. In other words, it surrounds the first part of the urethra. It is composed of from twenty or more acini which empty through their ducts into the urethra. The ejaculatory ducts, made by the union of the vas deferens and the ducts of the seminal vesicles, pass through the compartment in the back of the prostate and also empty into the floor of the prostatic urethra.

The function of the gland is to secrete a fluid which mixes with the testicular fluid and later with that from Cowper's glands to make the semen.

The position of the prostate is behind the pubes. It is, roughly speaking, bound by the bladder above; the pubes, anterior bladder ligaments and dorsal vein of penis in front; the rectum behind; the levator ani muscles on the sides and the triangular ligament below. It will thus be seen that it is difficult to examine the gland, without the use of instruments, from any other quarter than from the rectum.

**Examination.**—The methods of examining the prostate are by the passage of a straight catheter, which will usually tell us if there is any deformity of the posterior urethra due to a pathological condition in the prostate. In such a case, the end of the catheter will run against the protrusion if the prostate bulges into the urethra; or if there are any pockets in this portion of the canal, the point of the instrument may enter them. An elbowed (coudé) catheter should in this case be passed, which will probably pass by all these irregularities if they are present and enter the bladder.

A stone searcher passed will tell us if there is a stone in the prostatic urethra. If this instrument is then passed into the bladder and turned so that its beak points downward and is drawn against the base of the prostate, the distance from the curve to the point of the shaft of the instrument which corresponds to the

meatus will tell us the length of the urethra. If this exceeds eight inches, it shows an increased urethral length and indicates prostatic hypertrophy.

The patient is then examined by the rectum, and its size, its consistence, the character of its surface and any other particulars interpreted by the sense of touch is determined.

An enlargement points to hypertrophy, to tumor, to cyst, to stone, to inflammation or to abscess; whereas, a diminution in size points to atrophy, lack of development or to more or less destruction.

An increased consistence (hardness) points to a malignancy, a calculus, tuberculosis or inflammation.

A diminished consistence (softening) points to a chronic atonic process or a softening abscess.

The character of its surface depends on many conditions. If there is a prominent, bulging enlargement of considerable size, it is probably a cyst; if one or both lobes are enlarged and hard, it points to a parenchymatous prostatitis. If there is a small, hard nodule, it points to a follicular, inflammatory or tubercular nodule; if it is soft, to abscess from the same causes. If the nodule is larger, it points to a follicular, inflammatory or tubercular lesion covering more space.

If crepitus is felt to be present, it points to the presence of stone.

When I began teaching genito-urinary diseases, I had extreme difficulty in making the students understand what they felt when examining a patient by the rectum. I accordingly demonstrated to them on a frozen section the relation of the anterior wall of the rectum to the prostate and vesicles. The following explanation of this method may serve to help my readers in knowing what they may expect to find on rectal examination.

Fig. 555.—Back View of Body Showing Sacral Region.

Fig. 556.—Sacrum Out of Body.

Fig. 555 shows the back, buttocks and thighs of a man standing. Fig. 556 shows the sacrum of the individual. If the sacrum is removed, together with the tissues behind and in front of it, including the posterior rectal wall, an

the incision is continued down to the anus, the anterior rectal wall is seen which forms a thin covering over the prostate, seminal vesicles and posterior wall of the bladder. The tissues are so deep in this locality, however, that it is difficult to demonstrate well the prostate and vesicles. I accordingly injected the rectum of a cadaver and froze the body, after which I made a section representing the plane of the body drawn transversely and vertically upward through the anus and rectum to a point just above the sacrum at which it was removed (Fig. 557). *ABC* shows the section with the line of incision of the portion of the body removed.

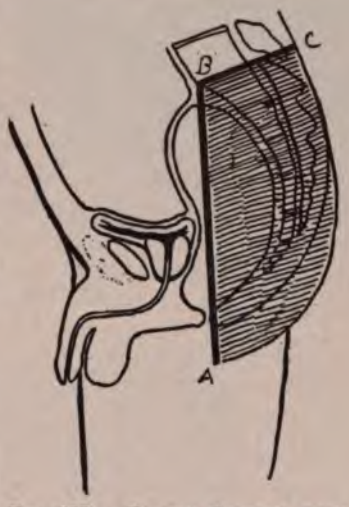



FIG. 557.—FROZEN SECTION WITH SACRUM MARKED OUT FOR REMOVAL.

After the removal of the part, the vertebræ and the section of the gluteal muscles (*BC*) could be seen above, and the deep muscles of the buttocks on either side, around which was the skin incision (Fig. 558). The central pear-shaped area represents the anterior wall of the rectum, in front of which the prostate and vesicles are situated. It was found that by placing in this space the picture of a normal prostate and seminal vesicles, and then pictures of the different pathological conditions, the student obtained a good idea of the various pros-

FIG. 558.—NORMAL PROSTATE IN SITU IN FROZEN SECTION.

tatic findings. It must be understood that these drawings are made not the idea of showing the student what he may see, but what he may feel. depict conditions which he must interpret by rectal touch. With this explanation, it is hoped that, when the reader of the prostatic chapter sees antesacral cuts, he will be able to understand what they are intended to as well as he understands the condition of the bladder and prostate when by means of a suprapubic bladder incision. He must at the same time re ber, when making the rectal examination of the prostate, that he is seein with his eye but through the end of his finger.

## ANOMALIES OF THE PROSTATE

Though anomalies of the prostate are very rarely known clinically, quite possible that they are much more common than we are led to belie the scarcity of the literature on the subject. Such anomalies as do exis not likely to give marked clinical symptoms, hence they are not often br to our notice. Whenever they have been observed, they have almost invar been associated with an arrested development of the sexual system in ge or portions thereof, especially in extreme cases of epispadias and hypospa

Complete absence of the prostate has been observed and reported by F Fischer, Littré, Godard, Dehn, Friese and Coemelli, in men in whom testes were either absent altogether or were undescended. Partial malf tions are much rarer and have been found in certain cases with other g deformities and in persons in whom the sexual apparatus in general ha advanced beyond the rudimentary stage. In these cases the prostate s with the rest of the sexual system in the general lack of development.

Lannois reports several cases of monorchidism associated with marke rested development of the corresponding lobe of the prostate and of the se vesicle of the same side, the opposite lobe and vesicle being normal. (K "System of Surgery.")

Malformations of the bladder do not affect the normal development o prostate. Occasionally, however, in cases of atrophy of the bladder, th a lack of development of the muscular fibers which encompass the bladder as a result of which the fibers do not join above. The base of the prost not usually affected in these cases.

Beraud mentions an unusual case in which the entire right half of the tate was congenitally absent, together with the corresponding half of the montanum; the rest of the sexual apparatus was normal. A case in whic entire prostate was absent in an otherwise normal man, is reported by F The subject was capable of indulging in coitus, which was followed b ejaculation of a fluid resembling semen, but in which spermatozoa wer found.

I have seen a number of cases in which the prostate was absent, but I have attributed it to some destructive process. Two cases I will mention, under the head of Anomalies of the Prostate.

Case I.—The first was a clerk, a young and healthy looking man twenty-three years of age, who had an infantile prostate, but as his external genitals were also juvenile, I feel that he should be classed rather under the head of "undeveloped genital tract." His sexual power was, however, good, and he had suffered from an attack of urethritis some years before.

Case II.—The second was a Greek flower vender aged forty-nine, whose prostate gland had but one lobe. Rectal examination showed an entire absence of the left lobe, while the right was twice the normal size (Fig. 559). The left lobe was not only absent, but the space left was so well defined and the

Fig. 559.—One Lobe of Prostate Missing—Congenital.

edge of the existing lobe was so clean cut that I was led to believe that it was a congenital malformation. When a sound was passed through the posterior urethra, it was interesting to note that the canal was principally in the existing part of the gland, and the urethra could also be felt over the instrument at the seat of the absent portion of the gland as a fairly thick membrane. The beak of the sound pointed to the healthy side on entering and the urethra was nearly encircled by the prostatic tissue on that side.

The absence of the left lobe may have been the result of a parenchymatous prostatic abscess that had entirely destroyed it; but as there was no history of such a condition and the feel of the absent side of the gland, as compared

with the existing side, was so different from the cases in which the absence of a lobe was due to an abscess, I believed it to be congenital.

I have had a number of cases of complete and partial destruction of the prostate due to abscess that I will mention in the section on deformities of the gland following prostatic abscess.

## INJURIES

Injuries of the prostate are not of frequent occurrence, inasmuch as this organ occupies a position where it is, comparatively speaking, protected from injury.

**Etiology.**—They may be caused by blows or kicks, or by a fall upon some sharp, pointed object. A fragment of bone, in a case of fractured pelvis, may also injure the prostate. It is also very often wounded in the course of surgical operations, such as perineal lithotomies. The introduction of trocars into the bladder through the perineum or the rectum for retention of urine were formerly causes; but not at present, as these procedures are now not employed. The most frequent of these injuries are false passages in the prostatic urethra caused by too forcible introduction of catheters. Recto-urethral fistulas after traumatic lesions of the prostate are included by some authors, as they are almost always the results of injury of the rectum during a perineal operation on the prostate and bladder.

**Symptoms.**—The symptoms of injuries of the prostate are pain and hemorrhage. The hemorrhage may be slight if the gland alone is involved, but where the prostatic plexus of veins is injured, the hemorrhage is much more severe. The blood runs into the urethra and bladder when the former is involved. An accumulation of blood in the prevesical space may also result from an injury to the vessels outside of the prostate. In any case, there may be dullness or a distinct swelling over the pubes.

In ordinary cases the wounds, if clean, heal rapidly, as prostatic tissue has excellent reparative powers.

The inflammatory reaction resulting from the traumatism may cause an obstruction of the prostatic urethra, producing retention of urine in cases caused by forcible introduction of instruments.

Lacerated wounds of this kind may allow entrance of urine into the tissue and there may follow urinary extravasation. This urine may infiltrate the tissues below the prostate, the perineum, scrotum, penis and abdomen; or it may flow upward and forward into the prevesical space, or backward into the cellular tissue. When the urine is septic, there is considerable danger of general infection.

If the wound becomes septic, a prostatic abscess may develop or the periprostatic plexus of veins may become the seat of a septic phlebitis, and pyemia

may follow. Pelvic cellulitis and pelvic peritonitis have been observed as the result of septic wounds of the prostate.

**Prognosis.**—The gravity of the condition varies according to the extent of the laceration, the amount of the hemorrhage and urinary infiltration; also in proportion to the degree of the sepsis of the urine. If there is no urinary extravasation or sepsis, the prognosis is excellent; whereas, if they both exist, the prognosis is very grave, unless prompt measures be taken to establish thorough drainage. In case the rectum is also injured, a recto-urethral fistula may follow.

**Treatment.**—The treatment of these injuries depends upon their extent, situation and the degree of sepsis.

In cases of an internal tear from forcible catheterization, it is necessary to pass a catheter through the urethra into the bladder to be retained for a few days; also to give the patient urinary antiseptics internally and plenty of fluids to drink.

When the laceration extends through the vesical sphincter and there is much hemorrhage into the bladder, a large woven catheter should be passed through the urethra and the bladder irrigated and the blood evacuated. If clots be present, they should be broken up and aspirated by means of a piston syringe.

In simple external wounds, the patient should be kept quiet and take two hot sitz baths a day; internally urinary antiseptics and a milk-and-Vichy diet. The catheter should be passed and retained if the patient has difficulty in urinating.

The treatment of urinary extravasation consists in promptly passing a metallic guide through the urethra into the bladder and making a perineal urethrotomy through the swollen area and then inserting a catheter into the bladder through the perineum or the entire urethra to drain the urine directly from the bladder. Sometimes in the deep wounds of the perineum, associated with hemorrhage, exudate and disturbed relations, we are unable to introduce either a guide or a catheter through the urethra after numerous trials. An attempt should then be made to perform a perineal urethrotomy without a guide; but in case the opening into and through the membranous and prostatic urethra cannot easily be found, it is advisable to open the bladder suprapubically, pass a metal guide down through the prostatic urethra into the perineal portion from the bladder and then to open the perineal urethra freely on this guide and pass a catheter through the entire urethra into the bladder. In this way, thorough drainage is established and, besides, the canal has the opportunity of healing about the retained catheter.

When there is an accumulation of pus in the perineum, a perineal urethrotomy should be performed and drainage established. If the prevesical space is involved, a suprapubic incision is made and a drain inserted. All areas of extravasation, in fact any accumulation of pus, should be incised and drained. Urinary antiseptics and supportives are given internally.

Contusions of the prostate from outside causes are very rare, as external perineal contusions usually affect the deep anterior urethra and occasionally the membranous. It is sometimes extremely difficult, when we are called to see such cases after an injury, to know what tissues are involved, as there is often an extensive swelling and discoloration in the perineum, due to blood and urine that has escaped into the tissues. We must therefore work quickly and reëstablish the route through the deep anterior, the membranous and the prostatic urethra before a dangerous general sepsis sets in.

# CHAPTER XLVII

## PROSTATIC CYSTS AND CALCULI

### PROSTATIC CYSTS

**Varieties.**—Cysts of the prostate are divided into hydatid (echinococcus), congenital and retention cysts. *Echinococcus cysts* of the prostate are said to be rare, and I doubt if they exist. In fact, I am led to believe from my experience with echinococcus cysts in the locality of the prostate, that they never spring from the prostate or seminal vesicles, but rather from between the rectum and the bladder. I cannot say positively, however, that such is the case and that they are never of prostatic origin.

*Congenital cysts* of the prostate are sometimes due to developmental anomalies. A special form is represented by cysts originating through closure of the sinus pocularis (prostatic utricle), followed by cystic dilatation of the latter and retention. These cysts, according to Springer, are not always congenital, but may be the result of preceding inflammations of the urethral mucosa (gonococcal). They may become large enough to encroach upon the rectum, where they can be felt.

The *retention cysts* due to the blocking of the ducts of the gland represent the variety that I have met with, and are those that principally claim our attention. Such cysts may reach a comparatively large size, sometimes causing retention of urine. I have had two interesting cases of cysts of moderate size that I will report later.

Retention cysts are common in the soft form of prostatic hypertrophy. They are usually small, and originate through compression of the ducts, followed by distention of the follicle behind the obstacle. The cyst contents consist in thickened prostatic secretion and finely granular detritus, with more or less numerous concretions. The seat of predilection of these cysts in the prostate is the middle portion immediately under the mucosa of the vesical neck.

**Symptoms.**—The symptoms are an uncomfortable feeling in the rectum and bladder, dysuria and retention. Catheterization for retention sometimes causes the rupture of these cysts into the urethra and bladder. If large enough, the cyst may be felt both abdominally and per rectum, although I have never seen

any of such size. Rupture into the bladder may lead to frequency of urinatior hematuria and pain. Rupture into the rectum would probably not be followe by symptoms unless the sac should become infected and I have never heard o such an occurrence. Cysts usually break into the urethra.

**Diagnosis.**—The diagnosis of prostatic cysts is not always easy and in ol men they are frequently confused with hypertrophy. They are sometimes mi taken for a distended bladder in urinary retention, or for vesical diverticul which have formed in the posterior bladder wall; but both of these conditio can be relieved by emptying the bladder by catheter and pressing on its wa through the rectum.

An echinococcus cyst is more difficult to diagnosticate, as but little of t prostate can be felt below the cyst. They are, however, usually larger th prostatic cysts according to my experience, as I have never seen a prostatic c that contained over two ounces of fluid, whereas I have never seen an echinoc cus cyst that contained less than eight ounces. The principal diagnostic t is to aspirate a certain amount of fluid through the rectum and examine t fluid to see if it is urine or cystic fluid.

In my own experience, cysts of the prostate have been rare. I have f small cysts about the size of a pea in hypertrophied prostates and seen them aft

Fig. 560.—Cyst of Prostate.

their removal, some of which may have been large enough to have pushed in the urethra and perhaps have given rise to some disturbance. I may have h cases in young men of prostatic cysts that have pushed into the urethra whic

I was not able to diagnosticate. The only cysts, however, that I remember that may be of interest to the readers were the following two:

Case I.—Man aged forty-five, who was sent for prostatic treatment. He had an uncomfortable feeling in the perineum. Examination showed a catarrhal prostatitis and a thickening in the left side, having a pultaceous feel (Fig. 560). He returned a few months later with the same symptoms and a well-marked cyst of the left lobe, one inch by three quarters of an inch in size, where the thickening had been (Fig. 561). He was treated for a short period and again went away and returned in several months with the cyst slightly enlarged and the same symptoms of catarrhal prostatitis. I worked on his case this time for two months, by massage and stretching the posterior urethra with a posterior Kollmann dilator, when he again left town. I felt that he was dissatisfied and that it would probably have been wiser to have opened the cyst freely with a galvano-cautery knife and drained it. About a year later he returned. He had seen no physician about his trouble since his last visit. An examination showed no cyst. The patient was a man who was chronically constipated, and I presume that the cyst had continued to grow and was finally pressed upon during a constipated movement of the bowel, accompanied by marked straining, to such a degree as to have caused it to rupture. The question of mistaking it for an abscess came up when it first developed; but it was ruled out and the succeeding visits confirmed the opinion. No loss of tissue was felt where the cyst had been.

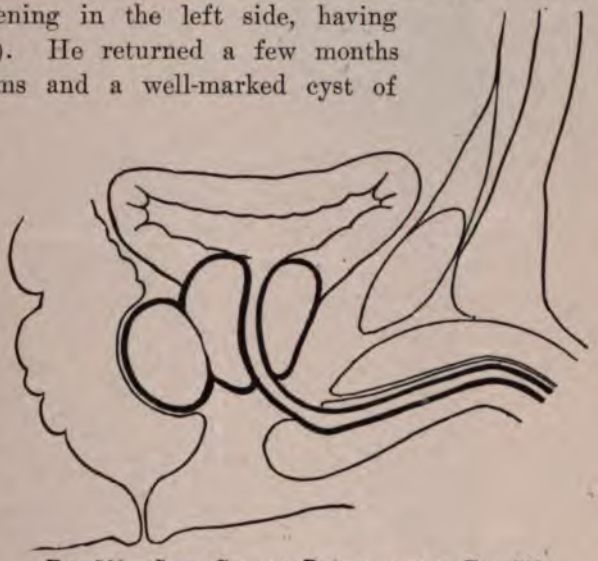


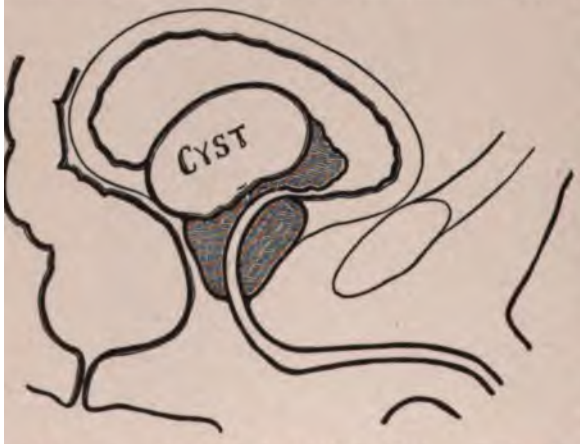
Fig. 561.—Same Cyst of Prostate as in Fig. 560, Sagittal View. (Diagrammatic.)

Case II.—The other case was a man of fifty-eight years of age in the City Hospital. He had suffered for some time from disturbances in urination with increasing frequency and difficulty, until at last he had an attack of retention for which he had been catheterized for some time without regaining spontaneous urination. His prostate was of large size, especially on one side (Fig. 562). He was considered a favorable case for a prostatic operation. During the examination immediately preceding the operation, a metal guide was passed into his bladder and his prostate was palpated upon it by the finger in the rectum. A thick fluid was seen escaping along the side of the instrument. I accordingly pressed upon the prostate and the flow increased. Between one

ounces escaped, after which he was able to urinate spontaneously. A
c cyst had broken into his urethra during the manipulation (Fig. 563).

Fig. 562.—Cyst of Prostate in Old Man, Mistaken for Prostatic Hypertrophy.

**Treatment.**—From my limited knowledge of cysts of the prostate, I feel
hat, as long as they do not give rise to urinary obstruction, it is not necessary
o treat them. If they do give rise to urinary obstruction, they should be opened through the urethra. If they do not give rise to much urinary disturbance and are very prominent in the rectum, I see no reason why they should not be opened by the rectal route and, if the incision is a free one, the walls will probably undergo atrophy, as in Case I. In the case of very large cysts grow- into the rectum—which must be very rare in that I have never discovered one in examining many thousands of




ig. 563.—Sagittal Section of the Same Cyst as in Fig. 562. (Diagrammatic.)

ases clinically—after opening them by the rectum, a portion of their sides could
e dissected away. I do not think that infection of a cyst cavity opening into

the rectum with perfectly free drainage would be a serious matter, and it would be easy to see and make applications to the cystic cavity by the proctoscope if indicated. It would probably be a colon bacillus infection.

## CALCULUS OF THE PROSTATE

**Varieties.**—Prostatic calculi are classified, according to their origin and location, into two groups: True or primary calculi, which are formed in the prostate; and secondary calculi, formed either in the prostatic urethra or above the prostate, which descend and engage in it. These secondary calculi will not be considered here, and the reader is referred to the chapter on Urethral Calculus for further information.

True or primary calculi are formed in the substance of the prostate gland from prostatic concretions. These concretions are the enlarged corpora amylacea first described by Virchow. They are large and small and usually arranged in layers. The large concretions usually lie in the middle portion of the gland and in the excretory ducts, sometimes blocking their urethral orifice, whereas the smaller concretions are found in all parts of the gland, often lying in large numbers in the interior of the partially dilated grandular tubules. They may be found in fairly large numbers in the normal gland of children and youths; but in older men they are often extremely numerous, while in the glandular form of prostatic hypertrophy, the dilated glandular ducts are sometimes found to be literally packed with these masses.

They are merely the result of a slight disturbance in the secretion of the organ and only acquire pathological importance when they lead to retention of the prostatic secretion by obstruction of the ducts; or when they contribute by occurring in very large numbers to an enlargement or other changes of the gland; or lastly and principally, when, in the course of time, they change their chemical character and are transformed into calculi by the organic constituents being replaced by inorganic salts, mostly calcium phosphate, sometimes ammonio-magnesium phosphate.

The number of calculi present may vary from one to several hundred. They are generally a little less than 1 mm. to 2 mm. in diameter, but may range in size from 2 mm. to 3 or 4 cm.

As a rule, the surface of these stones is smoother than that of the ordinary calculi; but chemical analysis may be necessary to establish the difference, as true or primary prostatic calculi usually contain the phosphatic deposits just referred to; whereas the secondary calculi are known to contain other salts and a nucleus. The lamellæ are of irregular thickness and organic matter is sometimes found between them. A gland containing many stones may have a sieve-like appearance on section. Calculus may be associated with glandular hyper-

trophy, or the entire gland tissue may be destroyed through pressure atrophy, leaving only the capsule.

True prostatic calculi are hard, nontransparent, porcelain-like, white, brown, or even black in color, showing radiations on cross section (Fig. 564). They very rarely appear to be large, but have been known to reach the size of a hen's egg and larger. The large stones are more uneven than the small ones (Fig. 565). The majority of cases of large prostatic stones that have been reported would probably, in the light of greater knowledge, be considered as secondary. Multiple calculi are often present in large numbers, even as high as 130. They may be of different shapes—oval, oblong or triangular—and present distinct facets. The calculi lie either separately in the prostatic parenchyma, each in a separate cavity, or several may lie together in one large cavity. They

Fig. 564.—Prostatic Calculi, Multiple, Showing Actual Size of Pearl Bodies. (Author's case.)

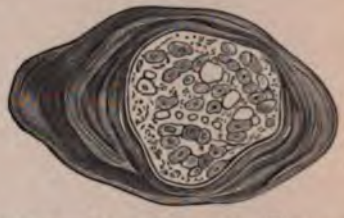


Fig. 565.—Large Prostatic Calculus. (From Cabot in Morrow.)

may be contained in only one half of the organ or in the entire gland, whi[illegible] will then appear enlarged, uneven and hard.

**Course.**—Prostatic calculi frequently lead to characteristic forms of chro[illegible]ic inflammation in the gland, with destruction of the secreting tissue and tra[illegible]s-formation of the same into a variable number of cavities, finally inducing a complete atrophy of the organ, which appears transformed into a thin-walled sac. These cavities may suppurate in certain cases, giving rise to large or sma[illegible]l abscesses, which may rupture spontaneously into the perineum or empty into the urethra, bladder or rectum.

Sometimes a true prostatic calculus may grow from the interior of the gland through the urethral wall into the lumen of the canal. When such true prostatic calculi increase in size in the urethra, through an acquisition of urinary precipitates, they usually grow toward the bladder and sometimes into it. Such calculi are often on account of their shape called hourglass stones (Fig. 566). They may also form from secondary prostatic calculi.

**Symptoms.**—Small stones, completely imbedded in the prostatic tissue, do not give rise to any symptoms, as a rule, or they cause very vague disturbances which are interpreted as due to chronic catarrhal prostatitis. But when these parenchymatous stones lead to suppuration or abscess formation within the gland, the symptoms of prostatic abscess with fever and sweating, manifest themselves, together with severe pain and difficulty in urination up to th

point of complete retention, and a fluctuating tumor may be palpated by the rectum.

A different group of symptoms is caused by stones which lie near the urethral mucosa or have broken through it. Disturbances of micturition preponderate under these conditions and there may be a purulent urethral dis-

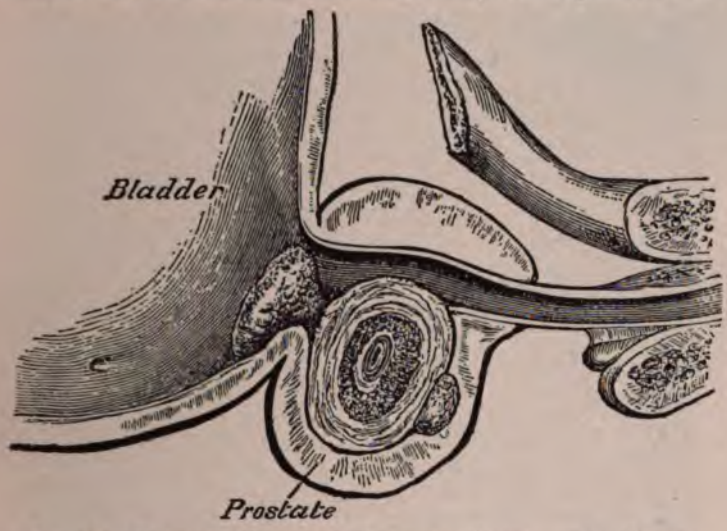



FIG. 566.—PROSTATIC CALCULUS, HOURGLASS SHAPE. (After Bryant.)

charge, or a hemorrhage from the urethra or into the bladder may occur. The patient complains of severe pains in the perineum or a pain on urinating, radiating toward the glans penis, together with tenesmus, sometimes followed by bleeding if the stone protrudes into the urethra (terminal hematuria). There may be urinary incontinence, due to overflow retention; whereas, in other cases, it may be due to a calculus projecting into the prostatic urethra and interfering with its function, or it may be due to a temporary paresis of the sphincter. Pain in the rectum and on defecation may also be present. All symptoms usually disappear promptly, after the prostatic calculi have been passed spontaneously or after rupture of a prostatic abscess caused by the stone or after removal by operation. In some cases, a urethral fistula or a prostato-rectal fistula is left behind after rupture.

**Diagnosis.**—The symptoms of calculi imbedded in the prostatic tissue are usually interpreted as chronic prostatitis, tuberculosis or malignant growth of the gland. In most cases in which prostatic calculi are present, a characteristic squeak or crepitus may be produced by pressure on the prostate through the rectum, which I consider pathognomonic of this condition. At other times where there are a large number of very small stones, the prostate feels as if it contained seeds. A very large stone can sometimes be made out by simple digital palpation, but this is usually insufficient in cases of an imbedded prostatic

calculus, although, by a combined examination with the finger in the rec and a metal catheter in the urethra, a hard body can be more clearly felt in prostate. When a portion of the stone projects into the lumen of the uret a typical sound or impulse is felt on striking it with a metal instrument.

FIG. 567 A.—RADIOGRAPH OF PROSTATIC CALCULUS. *S* shows the stone. (Author's case.

*Radiography* represents another diagnostic adjunct and concealed stones frequently be demonstrated in this way after other examinations have pr negative (Figs. 567 A and 567 B).

**Treatment.**—When the diagnosis of stone in the prostate has been m and the prostate is felt to be enlarged and indurated, the calculus shoul removed either by the perineal or suprapubic route. Calculi which ject into the prostatic urethra should be removed by the perineal r unless the stone is felt to be very large. If the perineal route is cho an ordinary perineal urethrotomy is performed on a metallic guide. forefinger of the right hand is inserted into the prostatic urethra and

of the left hand into the rectum and the calculus is carefully palpated and exactly located. A small bistoury is then inserted along the finger of the right hand, as in the operation for opening a prostatic abscess; the bistoury is then turned so that its point touches the prostatic urethra in the region of the stone, and it is then drawn down so as to cut through the urethral wall on to the stone; after which the incision is stretched by artery forceps and the stone grasped and delivered. The tip of the forefinger should then be inserted into the cavity to see if more calculi are present and, if found, they are removed by means of forceps with curved blades, or by a small spoon curette bent at the proper angle. The prostate must be palpated bimanually again, and, if another calculus is located, which cannot be removed by the forceps or curette, an incision should be made down to it in a similar manner and it is then removed in the way just described. A perineal tube is then inserted into the bladder through the perineal incision and the prostatic urethra, and should be retained a few days for drainage.

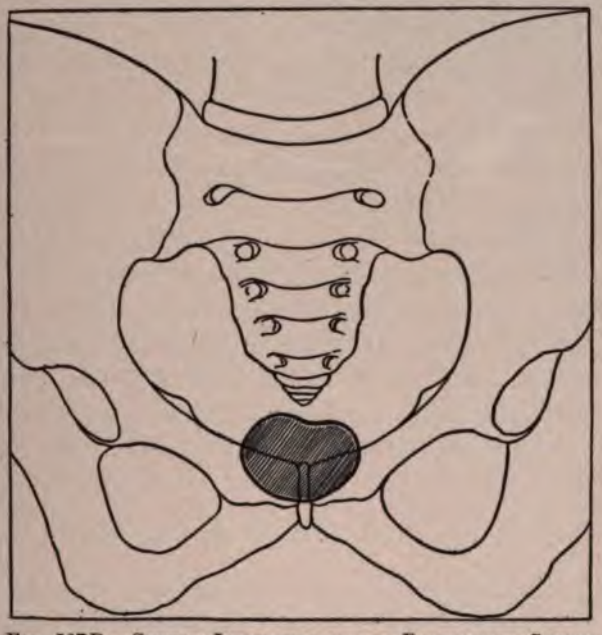


FIG. 567 B.—SKETCH INTERPRETING THE RADIOGRAPH SHOWN IN FIG. 567 A.

I do not believe in the perineal incision down to the prostate anterior to the rectum which has been highly recommended, nor do I believe in the one through the anterior wall of the rectum. If the stone is so large that it is a question if there is sufficient room to remove it through a perineal urethrotomy wound, then a suprapubic incision should be made.

A suprapubic cystotomy is performed. An incision is then made through the prostatic urethra down to the stone, care being taken not to wound the bladder sphincter. The opening is then stretched and the stone grasped and removed by forceps. Suprapubic drainage should be kept up for two to four days after the operation.

# CHAPTER XLVIII

## PROSTATITIS, PROSTATIC ABSCESS AND PROSTATORRHEA

PROSTATITIS is divided into two main classes—acute and chronic. Acute prostatitis may be divided into subacute or catarrhal, and acute follicular and acute parenchymatous. These troubles are called acute either when they occur during an acute attack of urethritis, independent of the severity of the symptoms, or when they are symptomatically acute. In the first instance, we have the so-called catarrhal or subacute prostatitis accompanying an acute posterior urethritis; whereas in the second group there is the follicular form, in which the inflammation is more active and the symptoms more marked, and the parenchymatous, in which the inflammation and the symptoms are very severe and the condition serious.

### SUBACUTE OR CATARRHAL PROSTATITIS

**Etiology.**—Subacute or catarrhal prostatitis is usually due to an extension of a posterior acute or subacute gonorrheal urethritis up the prostatic ducts of the gland to the acini. It is an inflammation of a mild degree and, whereas it is in a way follicular, it is not classified as such.

**Symptoms.**—The symptoms of this type of prostatitis include slight frequency of urination and a dull pain in the perineum, and perhaps some burning and tenesmus. The symptoms of the accompanying posterior urethritis may be less severe or equally mild. When the symptoms of posterior urethritis are more marked, there may be present more defined pain in the perineum, very great frequency of urination accompanied by a burning pain and tenesmus and often pain in the glans penis; sometimes there is a slight hematuria, blood following the act of micturition. It is difficult, therefore, to interpret in such cases from the clinical symptoms, whether they are due to the inflammation of the prostate or the posterior urethra.

**Diagnosis.**—An examination by the rectum shows slight enlargement and tenderness of the prostate. An examination of the urine may also give us some idea of the condition of the prostate. If the patient were to pass two specimens of urine of say two ounces each time, showing the first urine to be turbid and the second specimen clear, and the physician were then to massage

the prostate and instruct the patient to urinate a third time, the presence of prostatic products in the last specimen, such as mucus and prostatic epithelia and a few pus cells, would show a prostatitis of this type to be present.

If both the first and second specimens were turbid, the third specimen would also be so, and it would be necessary to have the patient empty his bladder entirely. The physician should then quickly pass a small soft-rubber catheter into the bladder, wash it and leave a small amount of water in the bladder, say three ounces, after which he should withdraw the catheter and massage the prostate. The patient should then void the injected water, and, if mucus, prostatic epithelia and pus cells were present, it would show the presence of catarrhal prostatitis.

The passing of the catheter and the injection of water into the bladder is mentioned as a means of determining this condition; but personally, I would not recommend it, as instrumentation in an acute or subacute urethritis, with such an involvement of the prostate, might, by its mechanical irritation, give rise to a more serious involvement of the gland. It suffices to know that, if a prostate is slightly enlarged and tender by rectal examination, in a case of posterior urethritis of short duration, and prostatic epithelia are found in the discharge and urine, a subacute prostatitis is probably present.

**Prognosis.**—Such a condition will either subside and cease with the posterior urethritis, or will develop into a follicular or a parenchymatous prostatitis, or become chronic.

## FOLLICULAR AND PARENCHYMATOUS PROSTATITIS

I will consider these two varieties of acute prostatitis together up to the point of suppuration, where they will be included in a separate chapter.

*Follicular prostatitis* is an inflammatory condition of the prostate in which one or more of the follicles are acutely inflamed to a more marked degree than in the catarrhal form just considered. A *parenchymatous* prostatitis is the same as the follicular inflammation as far as the follicles are concerned; but besides this, it is more diffuse and more acute, as the perifollicular tissue, the stroma, is also affected. One or both lobes of the gland are involved in this form of the disease.

**Etiology.**—These two forms of acute prostatitis usually begin in the acute catarrhal form just mentioned, during an acute attack of urethritis two to four weeks after its commencement. They are also liable to occur when a chronic prostatitis is influenced by some exciting cause, such as exposure to cold or wet, chilling of the extremities, overindulgence in drink or coitus, traumatism due to the passage of instruments or from medication, or hard riding on a horse or bicycle. It may be hastened by traumatism through forcible instrumentation, the lodgment of calculi, by the back pressure of solutions during urethral

irrigations by hydrostatic pressure, or from urethral obstructions or stricture. The infectious diseases, such as scarlatina, measles, typhoid, smallpox and chicken-pox, are also spoken of as causes.

FIG. 568.—FOLLICULAR PROSTATITIS. (Diagrammatic.)

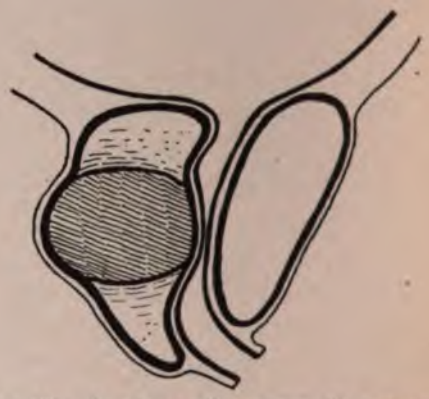


FIG. 569.—FOLLICULAR PROSTATITIS, DEVELOPING INTO ABSCESS. (Diagrammatic.)

**Pathology.**—In *acute follicular prostatitis*, the condition of the prostate is one of catarrhal prostatitis plus an acute inflammation of one or more follicles in either lobe of the gland, showing as localized areas of inflammation. The inflamed follicle is enlarged, reddened and indurated (Fig. 568). There may be a perifollicular inflammation. Two or three follicles may be involved in the same vicinity, all with a perifolliculitis, and the result will be a larger inflamed nodule (Fig. 569). In *parenchymatous prostatitis*, the inflammation is much more acute and widespread. Both the follicles and the stroma in one or both lobes become involved in the acute inflammatory process. The lobe is then very much enlarged; or both lobes, in case it is bilateral, and increased to two or three times the natural size (Fig. 570).

FIG. 570.—OUTLINE OF THE PROSTATE IN PARENCHYMATOUS PROSTATITIS. (Diagrammatic.)

If an inflammatory nodule breaks down, an abscess will develop and will probably rupture into the urethra (Fig. 571), leaving an abscess cavity which later contracts and cicatrizes (Fig. 572). When a number of adjacent follicles and the perifollicular tissue have become inflamed at the same time and broken down together and coalesced in a mass, the resulting abscess will be much

larger, and in healing there may be considerable loss of tissue, manifested by rectal touch as a thinning or depression at this point (Fig. 573). Sometimes

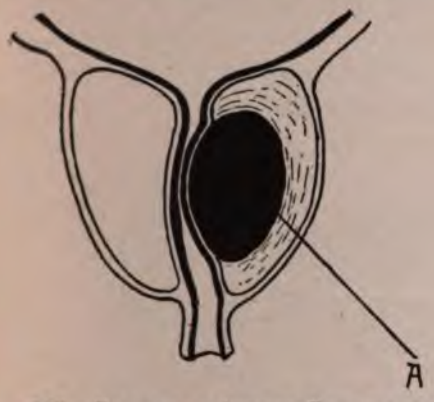



Fig. 571.—Follicular Abscess Pointing into Urethra. *A*, the abscess. (Diagrammatic.)

Fig. 572.—Follicular Abscess Broken and Cicatrizing, Leaving Opening into Canal. (Diagrammatic.)

pus cavity, capable of holding sufficient urine to maintain an irritation and suppurative process, persists for months and years.

In the *parenchymatous* form, when one lobe or both have broken down into an abscess, the entire gland tissue of half or the whole of the gland may be destroyed and nothing remain but a slight thickening composed of the prostatic capsules (Fig. 574). In

Fig. 573.—Follicular Abscess, Showing a Depression at this Point as Felt by Rectum. (Diagrammatic.)

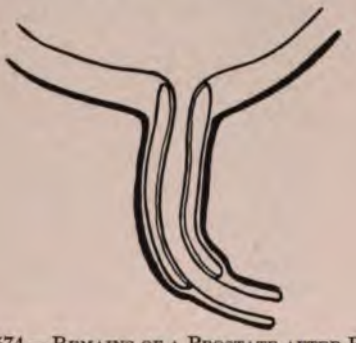


Fig. 574.—Remains of a Prostate after Parenchymatous Prostatic Abscess in which the Prostate Has Been Nearly Destroyed. (Diagrammatic.)

the case of a patient dying of some intercurrent disease when suffering from this trouble, a cross section would show some small pus foci in the follicles which could be expressed; but if a small abscess were present, a larger collection would be seen in this area, or a cavity opening into the urethra. Small nodules might also be seen, having no tendency to pus formation.

The *circumscribed or follicular form* is characterized by one or more localized areas of inflammation, which may be situated in either lobe of the gland. The follicles and prostatic ducts are inflamed and filled with pus. If their orifices are closed by the inflammatory process, small collections of pus are seen or often small follicular abscesses. When a number of these small abscesses coalesce, an abscess of larger size is seen and the interstitial tissue is broken down.

FIG. 575.—INFLAMMATORY NODULE IN A CASE OF FOLLICULAR PROSTATITIS.

In *acute parenchymatous prostatitis* when both lobes are involved, the gland may be enlarged to twice or three times its usual size, causing marked compression of the urethra. The entire organ is congested and its consistence increased. The organ appears darker in color, owing to the amount of venous stasis. The mucous membrane of the prostatic urethra is deeply congested and swollen. On section, a reddish-brown fluid exudes from the gland. This consists of inflammatory products, serum and pus, tinged with blood, together with some prostatic secretion. The amount of pus varies with the stage of suppuration.

The microscopic features of the diffuse variety are those of an exudative and suppurative inflammation. The ducts of the prostate are the first seat of the inflammation (Cohnheim, Segond). The affected acini are filled with serous or bloody exudation, and their walls infiltrated with small round cells. If the inflammatory process continues to advance, the suppuration extends and the whole prostate as well as the periprostatic tissues become involved. There

are numerous small or large abscess cavities and the intervening parenchyma undergoes disintegration, resulting in a typical prostatic abscess. The pus probably always contains gonococci or other septic microörganisms.

**Symptoms.**—The subjective symptoms of *follicular prostatitis* are frequency of urination, burning and pain during the act, difficulty in urinating and sometimes retention. The urine is generally quite turbid. There may also be a feeling of dull pain, heaviness and discomfort in the perineum, and at times an uncomfortable feeling in the rectum. The urethral discharge from the anterior urethra diminishes or ceases, when the complication begins, although it may be quite profuse in the prostatic urethra behind the cut-off muscle. The urine is generally very cloudy. On examination by the rectum shortly after the pain in the perineum with the frequency of urination have been noticed, the physician will discover one or more tender nodules in the prostate (Fig. 575). The temperature may be elevated from one to two degrees or more. Retention of urine occasionally occurs during this type of prostatitis, necessitating cathe-

Fig. 576.—A Number of Inflammatory Nodules and a Cavity Resulting from the Breaking Down of Others.

terization. This is due to a nodule composed of one or more follicles bulging into the prostatic urethra. Catheterization is sometimes very difficult in these cases, on account of spasm of the cut-off muscle, and causes traumatism even when great gentleness is used. Frequently so much time is required for catheterization, that it is advisable to retain the catheter when once it has been passed (see Fig. 569). A chill may occur, especially after instrumentation, and the temperature increase.

Favorable cases undergo resolution, the temperature, pain and urinary disturbances subside, and the discharge returns or else the attack may become recurrent or chronic. In other cases, the nodules break down into abscesses and discharge into the urethra or by some other route (Fig. 576).

The symptoms of *parenchymatous prostatitis* are more severe. The patients complain of frequent urination both during the day and night, accompanied by pain and tenesmus. The force of the urinary stream is less and urination is more difficult. Retention of urine is much more common than in the follicular form. There is also a sense of weight in the perineum and a feeling of pain, fullness and pressure in the rectum, particularly when the bowels move. Sitting straight on both tuberosities of the ischium is uncomfortable, especially when riding, and the patient sits on one tuberosity to obtain relief. The temperature may be elevated to 101° to 102° F., even when there is no suppuration present. The patient usually feels decidedly uncomfortable and sick.

Fig. 577.—Left Lobe Parenchymatous Prostatitis.

Examination of a patient by rectum in parenchymatous prostatitis shows one or both lobes to be very much enlarged (Fig. 577). The enlarged portion of the prostate feels hot, hard and turgid, and is tender on pressure. When it involves both lobes, it resembles in shape and size a large hypertrophied prostate and, like the latter, has grown as much as possible posteriorly and laterally, and then, on account of the dense fascias preventing further extension, has extended along the lines of least resistance, that is, into the space which the urethra occupies, and has followed the canal on its outside up under the floor of the bladder. In this way it causes an obstruction to urination in the same

manner as prostatic hypertrophy, and consequently gives rise to retention of urine. Hemorrhoids are sometimes noticed.

**Diagnosis.**—Acute prostatitis is to be differentiated from acute posterior urethritis, cystitis, acute seminal vesiculitis, acute Cowperitis and acute retention due to stricture and hypertrophy.

In all these cases, our chief reliance is in rectal examination. In *acute posterior urethritis* and in *cystitis,* there are no rectal symptoms nor any nodular or general prostatic enlargement on examination, and, if pain in the perineum is present, it is not so marked, while there is never retention of urine with acute posterior urethritis or with cystitis, unless accompanied by stricture or prostatic hypertrophy.

In *Cowperitis* the tender spot is to one side of the median line of the perineum, just in front of the anus. The examination of the prostate is negative. Rectal symptoms are also absent.

*Hypertrophy* of the prostate can be differentiated by the absence of febrile symptoms, by the age of the patient, by the history of the case not occurring during an attack of urethritis. Rectal examination would show it not to be a case of follicular prostatitis by the absence of characteristic nodules. *Urethral strictures* would be diagnosticated by the absence of an acute attack of urethritis, by the absence of fever, of prostatic enlargement and nodulations and by the presence of stricture on examination of the urethra.

*Seminal vesiculitis* is rarely very acute. There is never retention of urine, although there may be a feeling of fullness in the bladder. The night frequency is not so common and the urine shows the characteristic skin, snowflake or sugar granules after massage. The vesicles can be felt by rectum to be enlarged and tender. Acute seminal vesiculitis and prostatitis are often confounded and often occur together. An inflammation of the prostate or an extension of the urethritis may shut off the seminal ducts by pressure and thus cause an accumulation of the vesicle contents, making them large and tender to the touch. Here we have a true condition of "seminal vesicle retention."

**Complications.**—*Periprostatitis* is the most frequent complication of an acute prostatitis, especially of the parenchymatous type. In these cases the inflammation follows along the ampulla of the vas deferens and the seminal vesicle, giving rise to a brawny swelling (Fig. 578). It may extend along one or both vasa deferentiæ. If along both ducts, the entire space between them is thickened. This usually subsides slowly and the periprostatic induration diminishes with the stage of resolution; or, if a prostatic abscess develops, after the part of the prostate involved breaks down and discharges into the urethra, the preprostatic induration generally subsides slowly. Sometimes the periprostatic exudate develops into a cellulitis and suppurates, although this, in my experience, has been extremely rare and I consider such an exudate as of a defensive nature to afford additional protection to the involved prostate. It

has been spoken of as a pelvic cellulitis in the male, which I think is a good name; but it must be remembered that it is not so apt to break down into a large abscess as is a pelvic cellulitis in the female. The symptoms of periprostatitis are the same as those of parenchymatous prostatitis, with the addition of a feeling of stiffness in the rectum. The process is slower than in the

FIG. 578.—PERIPROSTATITIS.

course of an uncomplicated parenchymatous prostatitis. Very often a periprostatitis extends up as far as the interureteral band and the edge of the interureteral band as felt per rectum is mistaken for the border of the base of the prostate.

**Prognosis of Acute Prostatitis.**—The prognosis of acute follicular and parenchymatous prostatitis is very favorable. In some cases of prostatitis, all inflamed follicles undergo resolution; whereas in other cases, some of the inflamed follicles or nodules may undergo resolution, while others break down into abscesses (see Fig. 576) and empty into the urethra. In the parenchymatous form, the whole of one or both lobes may break down into abscesses and be destroyed. The percentage of the inflamed areas, both in the follicular and parenchymatous forms, that undergo resolution and that suppurate, would be very difficult to estimate, as many cases are so mild that the diagnosis is not made. When abscesses develop, the prognosis is not so good.

## ABSCESS OF THE PROSTATE

**Etiology.**—Prostatic abscess, in the cases coming under my observation, is in nearly every case due to an acute follicular or parenchymatous prostatitis following an acute attack of urethritis. It is also due to the *exanthemata, smallpox, chicken pox, scarlet fever, measles* and *typhoid.* Cases complicating the exanthemata are, however, more liable to fall into the hands of the general practitioner, and I am inclined to believe that they are often not recognized. I base this opinion on the number of patients that I have examined with deformed prostates, such as one finds following abscess of the prostate, who have no history of ever having had an attack of urethritis. I will mention later in the chapter a case of abscess of the prostate complicating measles.

**Symptoms.**—In follicular prostatitis, the inflamed follicle or a mass of follicles either undergo resolution or break down into a prostatic abscess. When a prostatic abscess develops, the patient will frequently have a sudden chill and a rise of temperature to 104° to 105° F., after which it may drop and run from 99.5° to 101° F. or from 100° to 102° F., together with occasional slight chills

Fig. 579.—Depression in Prostate after Rupture of a Small Follicular Abscess.

and profuse sweating, which point to abscess formation and septic absorption. Some patients have repeated attacks of retention. By examining the patient every day per rectum, the physician will keep himself fairly well posted as to his condition, as he will notice that the hard and tender nodules, which he has felt on the surface of the prostate per rectum, are softening. Shortly after-

wards, he may notice that there is fluctuation present. If the temperature suddenly goes to normal or near normal and the patient feels relieved, he will think that the abscess has broken into the urethra; and if he finds that it has diminished in size, he will be quite assured of the fact.

It not infrequently happens that spontaneous rupture is followed by a closure of the mouth of the cavity, and, as a result, all the symptoms and conditions existing previous to the rupture return, though not to such a severe degree as before. Unless the cavity is opened and treated surgically, this condition may continue and become chronic. When, however, the opening made at the time of the spontaneous rupture is large enough, the wound heals perfectly, and the shrunken cavity is replaced with new connective tissue, which can be felt per rectum as a hard, depressed area. Fig. 579 shows the depression felt in the prostate after the rupture of a small follicular abscess.

A few days or a week after a group of inflamed follicles has broken down into one abscess and discharged into the urethra, the physician may notice, where the abscess has been, that there is quite an appreciable depression in the prostate. Fig. 580 shows marked depression after prostatic abscess of several

Fig. 580.—Depression in Prostate after Several Follicles have Broken Down into an Abscess in One Lobe.

follicles in one lobe. I have seen patients with an acute urethritis have a chill ten or twelve days after its commencement, with an abscess the size of a large pea and a septic temperature for two or three weeks; whereas others have abscesses that break down and discharge into the urethra with scarcely any symptoms. The size of the abscess as estimated by rectal touch is often mis-

leading, as it may appear small on the back of the prostate, whereas it may be large near the urethra or in some other part of one of the lateral lobes. Sometimes there is no evidence of softening, but some part of the prostate has a brawny feel and is enlarged and the patient is running a septic temperature. Such an abscess has a thick wall and probably is developing slowly.

FIG. 581.—DEPRESSION IN PROSTATE AFTER ABSCESSES OF BOTH LOBES. (Follicular or parenchymatous.)

The disease usually follows the same course in the parenchymatous prostatitis. The patient has a rise in temperature, chills, sweating and headache, as an abscess develops. The formation of an abscess gives rise to a throbbing pain. The abscess is much larger than in follicular prostatitis and the loss of tissue correspondingly greater. Fig. 581 shows depression felt by rectum in a patient with partial destruction of both lobes of the gland by numerous follicular abscesses or partial destruction by double parenchymatous prostatitis. If a parenchymatous abscess breaks into the urethra, as it usually does, the patient may notice that he is passing a peculiar urine, white, or red and white, and he brings it to his physician for examination. On one occasion, a patient suffering from an attack of acute urethritis, who had been a regular attendant at my clinic at the Post-Graduate and whom I had not seen for a few days, walked in and handed me a bottle containing a red fluid with a thick white deposit, the appearance of which was that of a deposit of two inches of sand, in the bottom of a four-ounce bottle, with a light red wine over it. It was the urine he had passed that morning. The white sediment was pus and the red fluid above, blood, urine and prostatic tissue. The patient had had no symptoms

during an attack of acute parenchymatous prostatitis that had developed into a prostatic abscess. As his discharge had diminished or ceased, which it frequently does in prostatic complication, he had remained away from the clinic, thinking that he was about cured. Rectal examination showed that both lobes of his prostate had been practically destroyed by the abscess. (See Fig. 574.) It is probable that this patient, possessing a nervous system not highly organized and not having had retention of urine, had given but little attention to such symptoms as dull pain, heaviness, more frequent urination, the presence of fever, but was principally watching the discharge for which he was under treatment and was pleased to see it stop.

If suppuration takes place, one or both lobes may develop into an abscess, and fluctuation may be felt on rectal examination, although sometimes the exudate is so dense, when the process is slow on account of the thick wall about the abscess, that fluctuation is not felt by rectum.

Sometimes these abscesses break during examination. On one occasion at the Penitentiary Hospital, a young man was brought in suffering from retention of urine. His symptoms were those of prostatic obstruction. While undergoing a digital examination by rectum, he remarked that pus was running out of his urethra. I accordingly continued to massage his prostate until the pus ceased flowing, when he was able to urinate. I might add that this patient developed a septic phlebitis and a septic pneumonia from which he died. A septic pneumonia occurred in a case that I observed with another physician. I have also ruptured these abscesses while passing catheters to relieve these patients of retention. On several occasions, when I have had patients under an anesthetic, prepared for a prostatic operation, after inserting my grooved metallic guide, I have noticed pus discharging along the gutter of the instrument, showing that the abscess had ruptured. In all these cases I left the instrument in place and massaged the prostate until the discharge of pus ceased, after which the patients had uneventful recoveries without having had to submit to an operation and the tedious and uncomfortable after-treatment.

I will take occasion to report here a case of *prostatic abscess complicating measles.* A jeweler thirty-five years of age had had no trouble with his genito-urinary tract for ten years and his urine was normal. During the attack of measles, he developed difficult and frequent urination. I examined him by rectum and found a very much enlarged and tender prostate resembling that of acute parenchymatous prostatitis. Retention quickly occurred, together with the symptoms of prostatic abscess. Accordingly I performed a perineal section and evacuated the pus. There may have been a latent pus focus in some part of his prostate that had existed for many years since his last urethritis, or it may have been a direct complication of the measles. I leave this question for the readers to judge. There had been no signs of urethritis or prostatitis before his attack of measles. Small hard prostates often follow the exanthemata.

*Cold abscess of the prostate* is another variety that I will speak of in referring to abscess occurring without any fever accompanying it. Two such patients were sent to me about eight years ago as cases of deep impassable urethral strictures. Both patients had had urethritis, but many years before this present trouble. In both cases the prostate was enlarged and in one fluctuation was present. The impassable stricture in both cases proved to be spasmodic, due to a prostatic abscess which was opened through a perineal urethrotomy incision.

**Prognosis of Prostatic Abscess.**—Follicular abscess of the prostate is rarely fatal. The health of the individual is sometimes affected, however, on account of the abscesses opening into the prostatic urethra and resulting in a chronic prostatitis with small cavities in which pus and urine collect and keep up the irritation. (See Fig. 572.) The prostatitis tends to make the patients neurasthenic. These cases often worry the physician considerably, especially if they are recurrent. If they do not break into the urethra, they should be operated on as soon as fluctuation is made out or the sepsis is marked.

In parenchymatous abscess, the disease is more severe, the suppuration more extensive and the complications graver. Septic periprostatitis and phlebitis of the prostatic plexus are the worst of the complications and it is stated that forty per cent of the deaths are due to these conditions. Personally, I have had but two deaths. One died of septic pneumonia. In the other case, death was not due directly to the prostatic abscess but to an existing pyelo-nephritis with an acute renal congestion, following a too complete emptying of the bladder for acute retention, which resulted in uremia.

The following table by Sigmund gives the relative frequency of the locality in which prostatic abscesses discharge. My own observations do not bear this out and while I have never kept a record of the locality of their emptying places, I believe that ninety-five per cent of all cases break spontaneously and empty into the urethra.

Sigmund's sequence of cases is as follows:

| | |
|---|---|
| 1. Into the urethra | 64 |
| 2. Into the rectum | 43 |
| 3. Into the perineum | 15 |
| 4. Into the ischio-rectal fossa | 8 |
| 5. Into the inguinal region | 8 |
| 6. Into the foramen ovale | 2 |
| 7. Into the navel | 1 each |
| 8. Into the sciatic notch | 1 each |
| 9. At the angle of the false ribs | 1 each |
| 10. Into the peritoneum | 1 each |
| 11. Into the perivesical cellular tissue | 1 each |

Fistulæ are said to remain in eight to nine per cent of the cases of perforation. I think, however, that the percentage is overestimated and that in the surgery of to-day, as we make our diagnosis and operate earlier, extensive abscess formations and fistulæ rarely occur. Even without operation, I believe that in ninety-five per cent of the cases the abscess would open into the prostatic urethra and the patient would recover.

## TREATMENT OF ACUTE PROSTATITIS

The treatment of *subacute catarrhal prostatitis* is simply the treatment of posterior urethritis, plus hot rectal douches. Later on, after the symptoms of acute posterior urethritis have subsided, massage of the prostate should be given every two to four days. The posterior urethritis should also be treated, if involved. (See chapter on Urethritis.)

When the patient first develops the trouble, he should be kept at home in a reclining position and should be given hot rectal douches of hot salt solution twice a day, of a strength of a drachm of salt to a quart of water, as hot as the hand can bear, by means of the recto-genital tube. These should be taken while the patient is sitting on the edge of a chair (see Fig. 593) or while reclining in a bath tub. (See Fig. 594.) Hot sitz baths are also efficacious given twice a day for ten minutes at each sitting; laxatives, such as citrate of magnesia, Rochelle salts, Carabaña or Apenta water, should be given every morning for the bowels. An alkaline diuretic and antispasmodic mixture, such as potass. citrate grs. xx, together with Tr. belladonna ♏ viij, should be given three times a day between meals in a glass of water, for burning and tenesmus.

The treatment of *follicular prostatitis* is practically the same as that of the catarrhal variety.

If the patient cannot urinate, he should be catheterized. If the catheter will not pass, he should be given a quarter of a grain of morphin by hypodermic injection, and then a hot sitz bath. Usually the patient will urinate easily in the bath, or a catheter will enter without trouble afterwards; but in case it requires some time to pass the instrument, it should be retained for a sufficient length of time to allow the spasm to wear off, sometimes for twenty-four hours. The difficulty is a spasm of the cut-off muscle, on account of an extremely tender prostatic urethra, due to prostatic inflammation.

It is advisable to use a straight soft-rubber catheter No. 10 or No. 12 French in these cases. If this will not pass, one with a curved beak, either soft rubber or woven, should be used. A metal catheter will often enter when the other variety will not, but it is more liable to cause traumatism. An elbowed catheter is better on account of the irregularity of the prostatic urethra, due to the inflamed nodules protruding into the canal (see Fig. 569), over which it passes more easily than does a straight instrument. When catheterization

is difficult, if a coudé woven catheter is passed to the cut-off muscle and gentle pressure made for a short time, it will gradually yield.

The treatment of *acute parenchymatous prostatitis* is in many respects the same as that of the follicular type. All local treatment of the prostate is discontinued except hot rectal douches of salt solution, as already mentioned in considering the follicular type, or hot sitz baths night and morning. Also saline laxatives every morning for the bowels and urotropin grs. x three times a day. If the patient has retention, he should be catheterized regularly, or a catheter should be passed and retained.

Fig. 582.—Abscess of Prostate as Felt per Rectum.

The treatment of *prostatic abscess* is surgical. If the patient has symptoms of sepsis, and enlargement or a fluctuating area is felt in the prostate per rectum (Fig. 582), the abscess should be opened by the perineal route through the prostatic urethra even though fluctuation is felt by the rectum, as the drainage into the urethra is better than into the rectum. Sometimes no fluctuation is felt in the rectum, but there is marked induration and enlargement over a certain area. If the patient is septic in these cases, a perineal urethrotomy should be performed, after which the finger in the prostatic urethra will discover the location of the abscess and it can be incised. It is important to use only the tip of the blade of a bistoury to cut with, and the rest of the blade should be wound with cotton

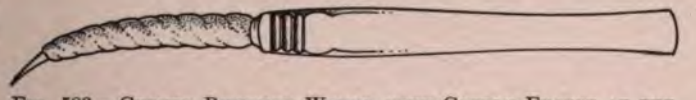


Fig. 583.—Curved Bistoury Wound with Cotton Except at the Point.

so that only the middle of the abscess is incised (Fig. 583), as in many instances the sphincter muscle of the bladder is cut, thereby resulting in incontinence. I have had a number of cases come to my clinic with this result because the incision had been made too long.

For other prostatic operations, see Chapter LIII.

The steps of the operation are as follows: (1) Perineal section; (2) dilate posterior urethra with the finger; and (3) insert a knife along with the forefinger into the prostatic urethra (Fig. 584). When the forefinger is over the main part of the abscess, which can be ascertained by its prominence in the urethra or by locating it with the forefinger of the other hand in the rectum, the knife is turned until its point is over the abscess, when, by a sudden dig into the tissues, accompanied by a very short pull toward the membranous portion for one quarter of an inch (Fig. 585), the abscess is opened and the pus escapes; the urethra then gaps at this point after the abscess has discharged. Other points of suppuration can then be looked for in the same way and opened.

Fig. 584.—Curved Bistoury Wound with Cotton, Inserted along the Forefinger.

These abscesses usually break and empty without operation, either from instrumentation to relieve retention or in exploration of the urethra. In case an operation is decided on, when the knife passes through the posterior urethra in making the perineal urethrotomy, it usually opens the abscess *en passant* and there is no need of having to resort to the steps above mentioned.

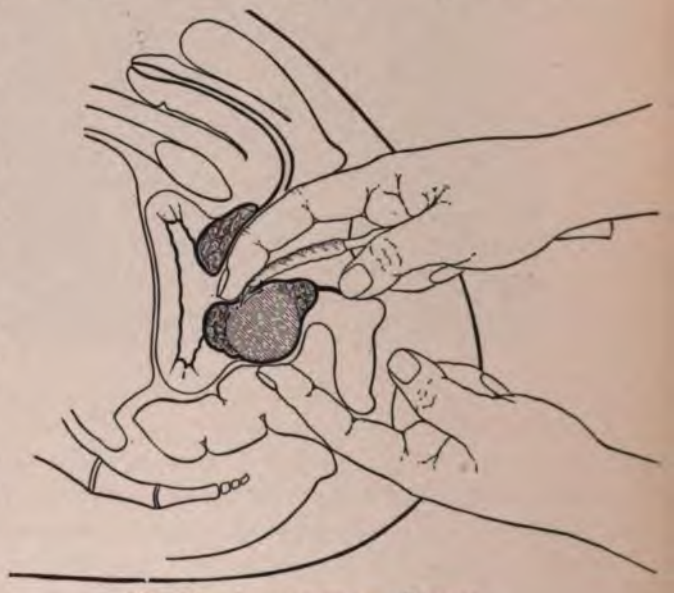


Fig. 585.—Incision in the Prostate.

## CHRONIC PROSTATITIS

**Etiology.**—Chronic prostatitis is a very subacute, long-standing inflammation of the gland. It is a very common affection, with an extremely variegated

symptomatology. It usually follows an attack of gonorrheal prostatitis, either of the catarrhal or the follicular type, although it may be the result of prostatic irritation and congestion and other infection. In all cases the etiological factor doubtlessly consists in bacterial infection. The aseptic type of chronic prostatitis develops as the result of sexual excesses. Chronic prostatitis may follow any type of acute prostatitis, most frequently acute catarrhal prostatitis.

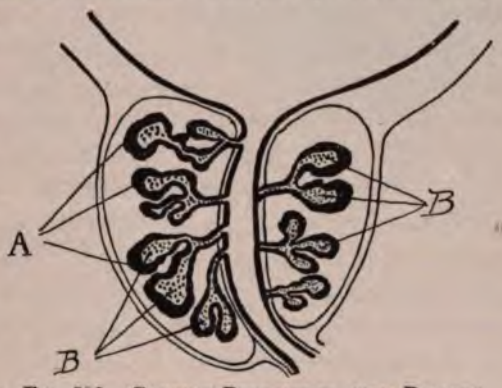


FIG. 586.—CHRONIC PROSTATITIS WITH DILATED ACINUS. (Diagrammatic.)

**Pathology.**—There are two types of chronic prostatitis: One following catarrhal inflammation of the gland, and another following the follicular or parenchymatous form. In the variety following the catarrhal form, the gland may be slightly enlarged and its consistence softened. The walls of the ducts and acini are thickened and the lumina of the former may be filled with detritus consisting of inflammatory products: Epithelia, mucus and pus (Fig. 586).

In the chronic prostatitis following the follicular and parenchymatous types, the gland is smaller. The condition just described may exist, but if it has resulted in abscess formation, it is in some places harder and thicker, due to fibrous masses; while in other places, where abscesses have been, it is thinner. The ducts and follicles are less numerous. In certain localities cicatrices are present which may compress some of the prostatic ducts. The areas resulting from larger follicular abscesses are depressions opening into the urethra and connected with it by a wide or narrow entrance. In these, pus and prostatic deposits may be seen. (See Fig. 572.) The most troublesome form of chronic prostatitis with transformation of a portion of the gland into a chronic abscess cavity that fills with pus and urine, occurs after large follicular abscesses have broken down and drained into the urethra. (See Fig. 581.)

**Symptoms.**—Certain cases of chronic prostatitis have symptoms entirely similar to those of posterior urethritis, and some present no symptoms at all. The symptoms of chronic prostatitis are dull pain or uncomfortable feeling in the perineum; sometimes a slight frequency of urination—perhaps six or seven times a day and once at night. There may be slight burning in the glans penis on urination. There may be a slight discharge, usually in the morning or during or after a movement of the bowels, when it may be abundant, or after urination when the patient strains. This is a *prostatorrhea* due to prostatitis and may be confused with gonorrhea and spermatorrhea. It is variously described as "white-of-egg," "white stuff," etc. It is generally associated with

a chronic posterior urethritis or a chronic anterior-posterior inflammation or seminal vesiculitis.

There are also nervous symptoms associated with this condition, such as go under the head of *neurasthenia*. The abnormal sensations in the prostate are described either as a dull, indefinite pressure in the perineal and anal regions, or rarely the patient may complain of very severe pains which may become excruciating and assume the character of true neuralgic attacks.

*Atonic impotence* is another symptom of chronic prostatitis, due to pressure upon the prostatic nerve plexus. *Nocturnal pollutions,* with or without dreams, frequently occur.

There are sometimes *exacerbations* of an acute type, due to indulgence in alcoholics, exposure to wet or cold, traumatism from instrumentation, in which case there is increased frequency of urination, tenesmus, pain in the perineum and an elevation of temperature if the trouble develops into a case of follicular prostatitis. An abscess may also develop in such cases. A urethral discharge is often present during an exacerbation.

Examination by the rectum shows the prostate to be enlarged, often boggy and tender to the touch. The first specimen of urine passed in chronic cases following a subacute catarrhal attack, may be clear; but it is usually slightly cloudy, with shreds coming from the posterior urethra, whereas the second urine is generally clear, unless the bladder or kidneys are affected. If, after the clear specimen has been passed, the prostate is massaged and another specimen passed, it is generally cloudy or turbid, with thick shreds, showing the presence of chronic prostatitis, and that the prostatic follicles have been full of mucus, pus, prostatic epithelia and inflammatory detritus, which have been expressed by massage. Sometimes the pressure on the prostate during the rectal examination gives rise to a detrusor spasm, followed by a spasm of the bladder sphincter which prevents the patient from urinating immediately even though he may try hard to do so. In cases following the follicular type, rectal examination shows depressions in certain parts of the gland, demonstrating the area of loss of tissue by follicular abscesses. (See Fig. 580.) Sometimes an area corresponding to a half of the palpable portion of the prostate will be felt depressed (see Fig. 581), showing that a number of follicular abscesses have coalesced and destroyed a larger area of tissue. Large masses of pus are expressed from these cavities. A *prostatorrhea* is also associated with chronic prostatitis and the leakage consists of prostatic epithelia, mucus, Böttcher's crystals, crescentic bodies, pus and perhaps gonococci. The presence of gonococci is very important. (See Examination of Urethral Discharges, Vol. I.)

In these chronic cases, one or both of the ejaculatory ducts may have been pressed upon to such a degree as to cause seminal vesicle retention, in which case the vesicles are felt to be enlarged. Tender areas on the prostate may

correspond to places where prostatic ducts have been shut off by contracting cicatrices and the follicles are not functionating.

**Treatment of Chronic Prostatitis.**—The treatment of chronic prostatitis is most trying and unsatisfactory as far as progress is concerned, and I make it a rule never to say definitely to the patient the length of time that will be required to effect a cure. It is advisable never to predict a cure in less than six months, and to add that it may take much longer.

The treatment consists in doing away with any congenital or pathological narrowings in the anterior urethra; dilating the posterior urethra by a posterior Kollmann dilator; the use of solutions of silver nitrate by instillation, by prostatic douches and by catheter injections; massage of the prostate; and internal remedies for the bowels, for the general health and for any particular symptoms that may develop.

The treatment is very unsatisfactory at times to both the patient and the physician, the former wishing that he had never begun the treatment and the latter feeling the same way. The patients are, however, steadily improving, although there are periods when improvement may cease for a time, or the condition may even become slightly worse for a few days, from the slight reaction following the opening of the follicles and cavities by dilatation. Exposure and dissipation attending the manner of living may also bring about these setbacks, and in such cases, the physician must have great patience and encourage the patient, rather than be pessimistic or indifferent. It is most important for him at the first visit to take a complete history of the case and write down every symptom of which the patient complains and especially to note the principal symptoms. It is particularly necessary in these cases to keep a most careful record, writing down at each visit his condition, any new symptoms that have developed, the treatment given, the effect of the last treatment, any change in the treatment and the reason why the change is made. The importance of a careful record will be found in a few weeks, when the patient is somewhat discouraged and says that he has not improved. If then the symptoms complained of are written down and compared with those of the first visit, a decided and progressive improvement will be noted, that will encourage the patient and help him in his cure.

It is very trying for these patients suffering from a chronic, hidden condition of this kind that they do not understand, to carry out a cure, as they sacrifice considerable time for the treatment. It also requires considerably more time on the part of the physician to treat them than to treat other patients, and I have at times felt relieved when they have discontinued treatment; but, although it may not be agreeable to treat patients who are constantly discontented, it is a great satisfaction to cure them after they have been constantly complaining of no improvement and they are very grateful afterwards. These patients usually come to a man who is

doing prostatic work because they have been to numerous physicians who promised to cure them in a few weeks and failed to do so. It is therefor visable to tell them at the start the maximum time estimated to effect a The symptoms that usually bring these patients are chronic discharge, l of prostatic fluid at stool or urination, frequency of urination, a feeling of comfort in the perineum, shreds in the urine and nervousness.

Local Treatment.—The first endeavor of the physician should be t stroy the *gonococci*. Any narrowings in the urethra should be treated by *tation*. If they do not yield, they should be cut. Each dilatation of strict whether before or after operation, should be followed by an irrigation solution of nitrate of silver (1:4,000 to 1:2,000), by hydrostatic pres or by filling the bladder through a catheter with the solution and then allo the patient to void the fluid. It is important to have a large canal to re the prostate of back pressure, which is a cause of prostatic irritation.

This having been accomplished, the urethra should be examined to s there are any areas of local inflammation which should also be treated. I urethral injections of solutions of silver derivatives or of astringents sl be employed by these patients at home, when there is a chronic inflamm of the anterior urethra. The posterior urethra, if involved, should be tr by instillation of nitrate of silver, from 1:500 to 1:50 in strength, by n of the Ultzmann syringe (Fig. 167, page 175, Vol. I). The prostate shou massaged.

Very shortly, the anterior part of the canal will be of normal size an prostatic urethra less irritable, and we can begin with the prostatic dilata This portion of the urethra cannot be dilated by a sound, as the size requ for its dilatation could not possibly be passed through the anterior part o

Fig. 587.—Dilation of the Prostatic Urethra with a Posterior Kollmann Dilato

canal. Of the two dilating instruments, the Oberländer and the Kollmann first is not serviceable, as the dilatation is in an anterior-posterior dire only, instead of a dilatation in all directions, such as is obtained by mea the Kollmann. The posterior Kollmann dilator (Fig. 587) enters wit sheath at the size of No. 22 to No. 24 French, and the posterior part o

urethra can then be dilated to a size up to No. 45 French; while, as the remainder of the instrument does not dilate, the portion of the instrument in the membranous and anterior urethra remains at No. 22 or No. 24 French. In dilating the prostatic urethra, it is important to find out to what degree a dilatation can be made without producing a reaction and, having determined this, to increase the dilatation one degree on each succeeding visit. These dilatations should not be made quickly, but should occupy from ten to fifteen minutes on each visit. They should not be made oftener than twice a week.

*Massage of the prostate* is most important in chronic prostatitis; in fact, in no condition is it of so much value. It causes the absorption of chronic exudates, it frees ducts that have been obstructed by pressure, it aids pus to escape from locations from which it does not drain freely. When the patient commences treatment, massage of the prostate should be given before the dilatations, as it tends to soften the prostate and render it less liable to traumatism. Later on, however, the dilatation should be made first, in order to stretch and open the ducts of the follicle and any passages into pus pockets, and thus render it easier to empty them of their contents by massage. When the massage is given first, the patient empties his bladder immediately afterwards and is then dilated; but when the dilatation is given first, the patient urinates enough to wash out his canal, after which he is massaged, and then urinates again in order to wash out the massaged products. A thorough massage of the prostate requires ten minutes, during which time no force should be used. The quick and forceful massage that resembles the winding of a clock or erasing a chalk mark with the finger, and lasts for a few seconds, such as is sometimes employed, does no good and may be productive of harm, if too much force is used. (See Fig. 240, Vol. I.)

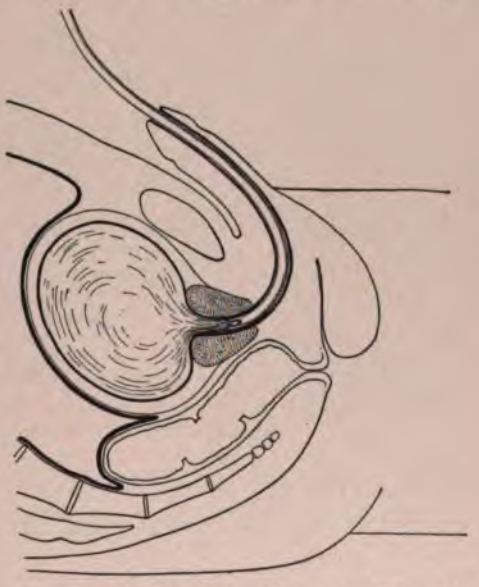


FIG. 588.—A PROSTATIC URETHRAL CATHETER WASH. Note the solution escaping from the eye of the catheter.

There are a number of ways of irrigating the prostatic urethra after massage and dilatation. One is the *urethra-bladder irrigation by hydrostatic pressure,* called the Janet method. I do not approve of this, as it tends to keep up the congestion of the prostate by the back pressure that it causes. Another method, used especially if the bladder is involved, is to have the patient urinate and then to pass a catheter into the prostatic urethra and irrigate this part of the canal, allow-

ing the fluid to run into the bladder, after which it can be voided through the urethra (Fig. 588). Another is simply to pass the catheter into the bladder after the patient has urinated, fill it and then have the patient void.

The prostatic douche is the most thorough way of washing out the irregularities in the prostatic urethra and the prostatic follicles (Figs. 589 to 591). This douche tube is ten inches long (25 cm.) and is shaped like a sound. For the sake of description, we will divide it into two parts—the proximal, nearest the hand of the operator, and the distal, the part farthest away from it. The proximal part is rounded, with two nozzles at its end, and the distal portion is flattened and terminates in a curve, the end of which is rounded. The point at which the rounded part of the tube joins the flattened part forms the dividing line between the proximal and distal portions of the tube.

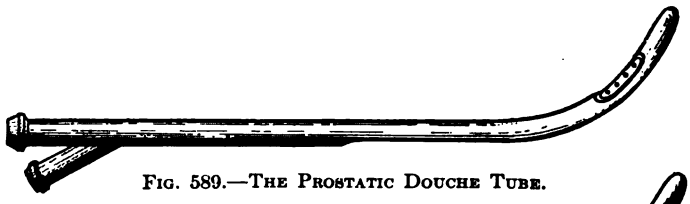


Fig. 589.—The Prostatic Douche Tube.

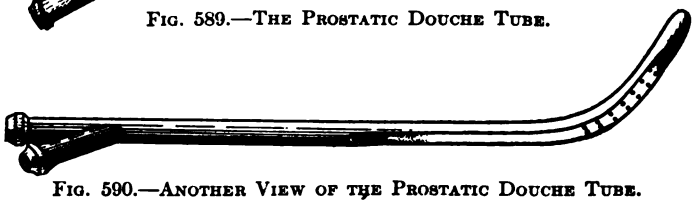


Fig. 590.—Another View of the Prostatic Douche Tube.

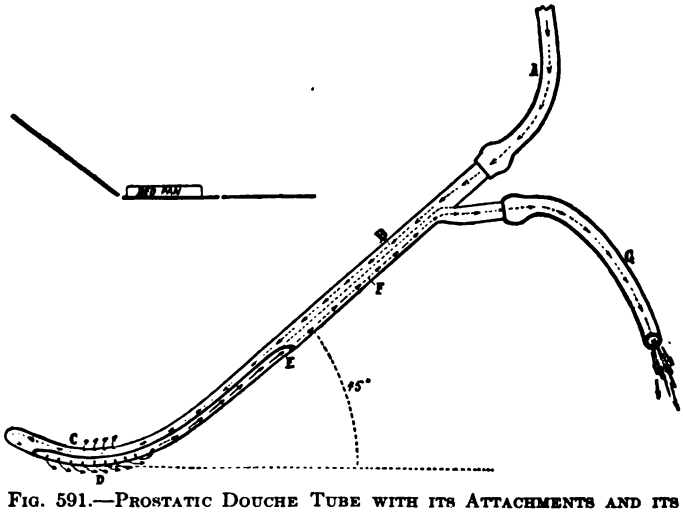



Fig. 591.—Prostatic Douche Tube with its Attachments and its Position in Relation to the Table.

The proximal part is No. 22 French in size. It is double current, its upper portion being connected with the inflow nozzle, and its lower portion with the outflow nozzle.

The upper portion of the proximal part of the tube is continuous with the distal portion, whereas its lower portion exists as a tube only as far as the point at which it joins the uncovered canal or gutter that extends along the convex portion of the distal part of the tube. In the convexity of this gutter are fifteen to twenty small openings into the lumen of the tube, while opposite on the concavity there are four similar openings.

The solution used flows from a reservoir, the bottom of which is about three feet above the patient's pubes, down a rubber tube *A* connected with the inflow nozzle of the prostatic tube, through the inflow portion of the tube *B* to its curved portion in the prostatic urethra, escaping through sixteen small holes in the convexity *D* and four in the concavity *C* into the posterior urethra, the walls of which it douches. It then runs along the gutter *D* in the convexity and enters the opening of the tunnel at *E*, flowing through the lumen *F* and escaping by the outflow nozzle attached to the piece of tubing *G* into some receptacle or vessel beneath the patient, usually a douche pan.

If the instrument is properly placed in the prostatic urethra, the solution will run into the posterior urethra, medicating it, and out through the gutter without going into the bladder. In order to have the instrument in such a position, it should be at an angle of about 45° with the table on which the patient is lying. The instrument should be inserted before having the pieces of tubing attached, after which the attachment can be made. The solution used is 1:8,000 to 1:2,000 nitrate of silver at a temperature of from 105° to 120° F.

In *atonic impotence* and *prostatorrhea* associated with chronic prostatitis, the prostatic douche tube is of incomparable value. In fact, massage of the prostate or vesicles and prostate, together with the prostatic douche, may almost be considered a specific in these conditions and far more valuable than any internal remedies.

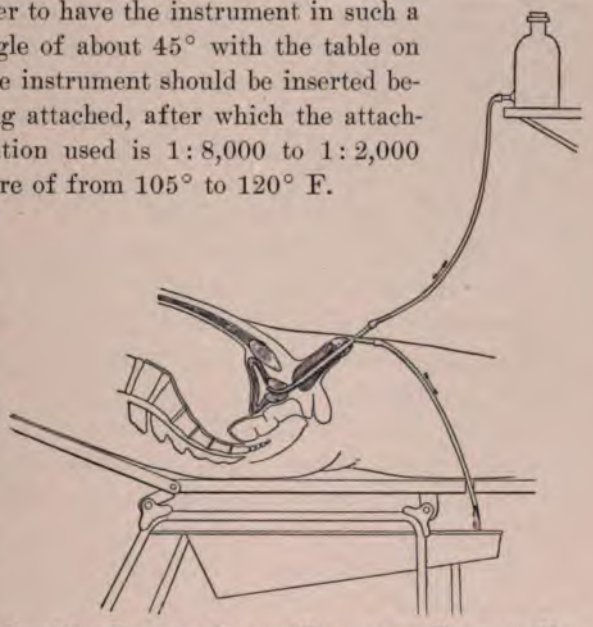


Fig. 592.—Prostatic Douche Tube in the Prostatic Urethra and the Water Flowing in and out of the Posterior Urethra.

This tube was the result of several years' study to construct an instrument for irrigating the prostatic urethra, during which time I had constructed various tubes, some of which were satisfactory. Finally, I accidentally stumbled on the principle that enabled me to construct it without difficulty.

I was called to Brooklyn to operate a case of prostatic abscess. After examining the patient per rectum and finding that it was a most suitable case, I inserted a lithotomy guide with long groove in its convexity, into the prostatic urethra and began to palpate the prostate over it in order to locate the abscess clearly and determine its relation to the instrument before the perineal prostatotomy. While manipulating the prostate, I noticed that pus was leaking down along the groove of the instrument. I accordingly massaged the prostate until

the flow ceased and told the physician that the operation was no longer necessary, as the pus had been evacuated. The patient recovered uneventfully. It was a lesson to me in prostatic surgery, as it taught me that a gutter was the simplest method of carrying away the outflow after douching the prostate through the urethra. I accordingly constructed the prostatic douche tube on the lines of a lithotomy guide, changing its curves, making the shaft hollow and converting the proximal portion of the gutter into a tunnel which I connected with a nozzle, so as to better control the outflowing stream of solution.

This tube was presented before the genito-urinary section of the New York Academy of Medicine, January, 1904.

The last method of treating the posterior urethra is by *instillations*. In all three different methods I use nitrate-of-silver solutions.

If there is an associated posterior urethritis with gonococci present, I believe that they are more readily destroyed by instillations of nitrate-of-silver solution 1 : 500 to 1 : 30. If the bladder is not to be washed out, I believe that the prostatic douche tube is the best; whereas if the bladder is also to be washed out, I believe that the catheter with its tip, either in the prostatic urethra or in the bladder, is an excellent method.

*Exacerbations of Chronic Urethritis.*—These attacks should be treated in the same way as an acute attack, that is, by taking locally a hot sitz bath or a recto-prostatic douche night and morning. Whereas, internally, a mixture containing tincture of belladonna ♏ vijss and acetate of potash grs. xv, is given and also sandalwood oil ♏ xv.

The recto-prostatic douche is given by means of the recto-genital tube (see Fig. 255) and is one of the best methods that we have of treating all prostatic troubles in which symptoms of pain and irritability of the gland are present.

The recto-genital tube is made of hard rubber. It is six inches long and three eighths of an inch in diameter. The shaft is straight until near the end where it has a slight curve corresponding to that of the back of the prostate. The tube is double current. The direct or inflow tube extends through the shaft of the instrument to an oval opening in its concavity. In the sides of the shaft just behind this opening are two other oval openings, each of which is twice the size of the one in the concavity. These two openings connect directly with the outflow tube. There is a nozzle on both the inflow and outflow tubes. The fluid used for this douche is salt solution made by putting a tablespoonful of table salt to a gallon of water. The temperature should be as hot as the hand can bear, that is, from 120° to 130° F. The douche bag or fountain syringe used as a reservoir should be so placed that the bottom of the bag is on the same level with the top of the patient's head.

The patient reclines on the edge of a chair with his feet on a table (Fig. 593); or he reclines in a bath tub (Fig. 594). He connects the inflow nozzle

with the tube from the fountain syringe and a short piece of tubing is connected with the outflow nozzle. The end of the tube is lubricated with vaselin

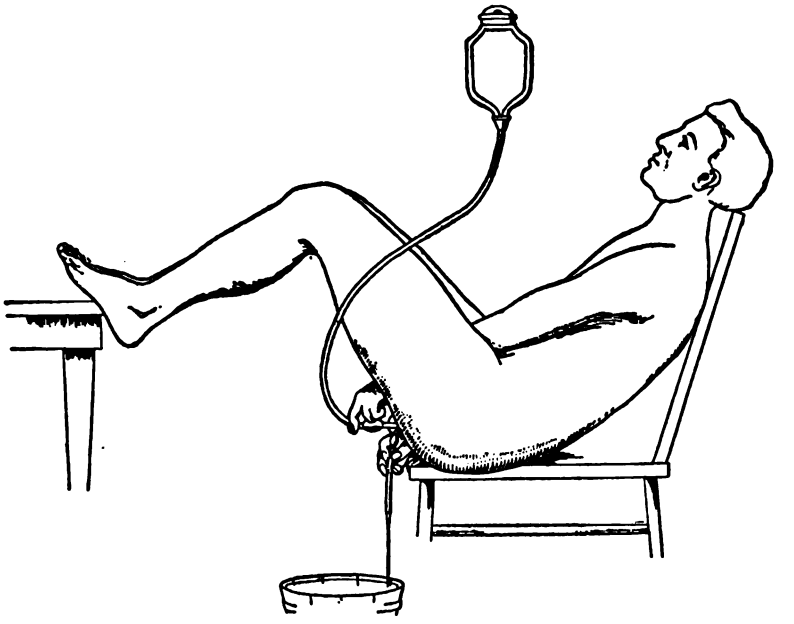


FIG. 593.—RECTAL DOUCHES IN CHAIR.

and inserted into the rectum for three inches. The solution from the bag is allowed to flow. It descends from the douche bag into the rectum through the

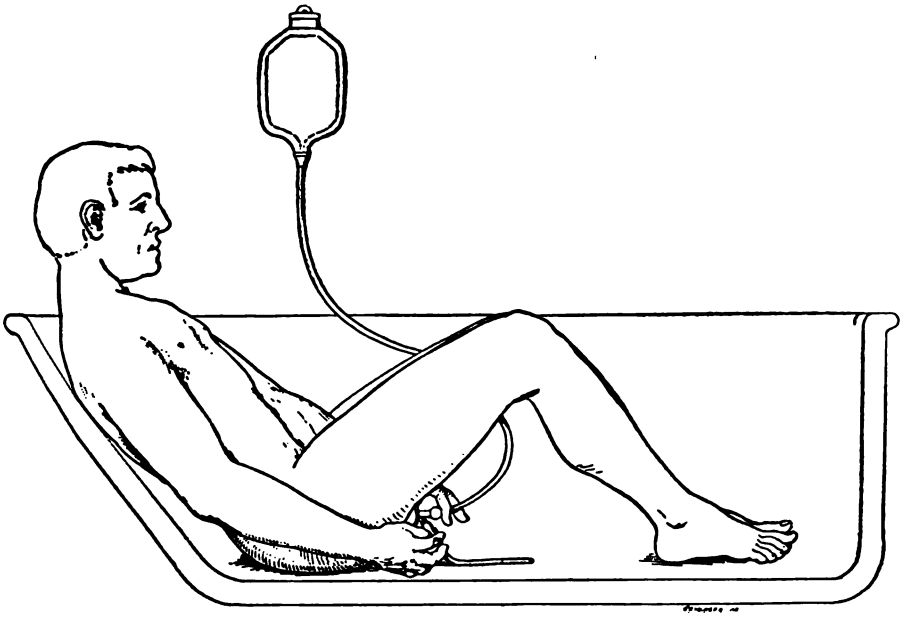


FIG. 594.—RECTAL DOUCHES IN BATH TUB, SHOWING POSITION.

opening in the concavity of the inflow tube, douches the prostate, expands the walls of the rectum and then runs through the openings in the sides of the tube

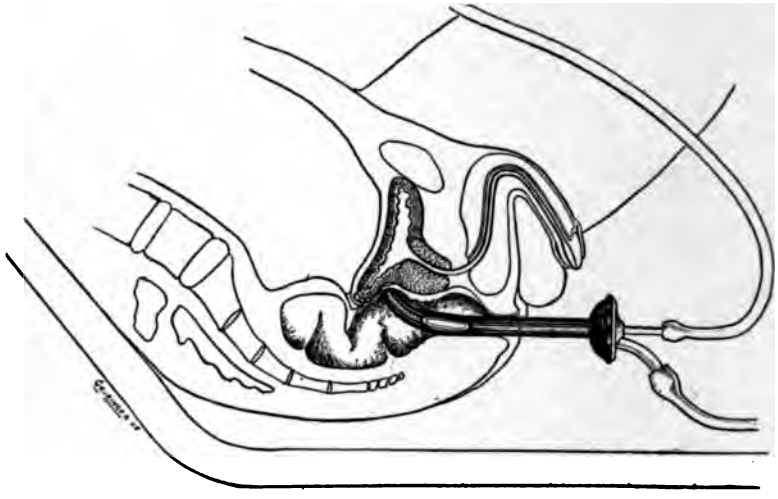


FIG. 595.—RECTAL DOUCHE IN BATH TUB, SHOWING THE TUBE IN THE RECTUM IN SAGITTAL SECTION.

and through the outflow tubing into the bottom of the bath tub or into a pail on the floor (Fig. 595).

INTERNAL TREATMENT.—It is a most important detail for patients under treatment to avoid congesting the prostate. The diet should be moderate in quantity, of the so-called simple order. Alcoholics and sweets are bad, as are all condiments. A whisky and soda, or a glass of Bordeaux or Zinfandel (California), with the dinner usually does no harm, and some cases are benefited by it. (See under Diet, Vol. I.)

The patient should be careful of his footgear and wear rubbers on rainy days. He should be especially careful to wear warm woolen clothing on his legs and to avoid draughts of air. Woolen socks and underclothing should be worn in winter and the patient should always change his clothing if wet. An overcoat should be worn, well lined in the back, as cold seats especially tend to cause prostatic congestion.

*Laxatives.*—The best laxative in these cases are the salines—citrate of magnesia or Rochelle salts, or still better, mineral waters, such as Apenta and Carabaña.

*Urinary antiseptics* are valuable when a patient is undergoing prostatic dilatation, but should be used only on the day of treatment, unless the instrumentation has caused some traumatism, in which case they should be administered until the irritation subsides. The best general urinary antiseptic is urotropin, grs. x t.i.d., but when the irritation is marked, it is advisable to use an antispasmodic as well, in which case a mixture containing sodium benzoate, grs. xv,

and tr. belladonna, ♏ viij, is preferable. A *tonic* treatment in these cases is strychnin, gr. $\frac{1}{60}$ t.i.d., or mist. ferri et ammoniæ acetate (Basham's Mixture), ℥ij, three times a day, after meals in a wineglassful of water.

Regarding *bathing,* a Turkish bath once a week is advisable. A hot sitz bath is recommended when there is much prostatic irritation. A shower bath in the morning on arising is an excellent tonic. *Electrical treatment* by the high-frequency current on the perineum, over the pubes and over the sacro-lumbar region, seems beneficial in some cases.

For *exercise,* golf and walking are the best spring and fall exercise; walking and skating the best in winter and surf bathing and swimming in the summer. Salt-water baths, however, do not benefit all cases and do not agree with some people.

For indoor exercises, see the chapter on Exercise in the first part of Volume I.

## PROSTATORRHEA

Prostatorrhea is a flow of prostatic fluid from the urethra. In a certain percentage of cases it is due to an atonic condition of the prostate, although it usually occurs as a symptom or complication of chronic prostatitis; but either condition may exist independently of the other. The discharge is a mucous fluid resembling the white of egg, containing mucus, leucocytes, cylindrical epithelium, concentric amyloid concretions and Böttcher's crystals; but when the discharge occurs during a case of chronic prostatitis, it contains in addition pus, perhaps gonococci, and often well-formed casts of the prostatic ducts. It is then a symptom of chronic prostatitis.

**Etiology.**—The most common cause of prostatorrhea is, therefore, chronic gonorrheal prostatitis. Less frequently, however, this condition is brought on, especially in young men who abstain from sexual congress, by excitation of the genital tract, associated with a strong sexual desire, which is frequently stimulated but not satisfied. Sexual excesses may also cause this condition by leading to an atonic condition of the gland.

**Pathology.**—There is a marked thickening of the prostatic ducts and follicles and relaxation of their walls, which in turn prevents them from close approximation and allows an accumulation of prostatic elements in the duct. There is probably also a condition of atony of the cut-off muscle, which allows the prostatic secretion to escape from the posterior urethra and appear at the urinary meatus. When chronic prostatitis is the cause of the prostatorrhea, the prostate will be found more or less enlarged, and sometimes very soft and boggy. The prostatic elements plus inflammatory elements often fill the ducts so that the slightest pressure per rectum by the finger or by a hard fecal mass will force the contents out into the urethra and later the discharge will appear at the meatus. (See Fig. 586.)

**Symptoms.**—Like chronic prostatitis, prostatorrhea presents symptoms that vary greatly in degree. In the mildest cases, the most common and, in fact, the only symptom is the mucoid discharge at the meatus. This discharge appears during defecation; at the end of micturition, when a muscular effort is made to expel the last few drops of urine; and also at times of ungratified sexual excitement. Many patients are very little concerned about this condition, and it does not seem to interfere with their general well being. In others with a neurasthenic tendency, however, prostatorrhea must be regarded as a serious disease. They brood over and worry about it, believing that they are discharging semen, and that this will tend to a loss of virility. This belief is often added to by the occurrence of premature ejaculations or poor erections, amounting practically to a state of *functional impotence*. Other symptoms of prostatic congestion or prostatitis, such as pains in the perineum, in the back and loins and the extremities are also accentuated. Some patients simply complain of an increased frequency of urination, associated with an apparent inability to fully empty the canal of the last few drops, and in addition, there is a feeling of tickling or an aching sensation in the posterior urethra.

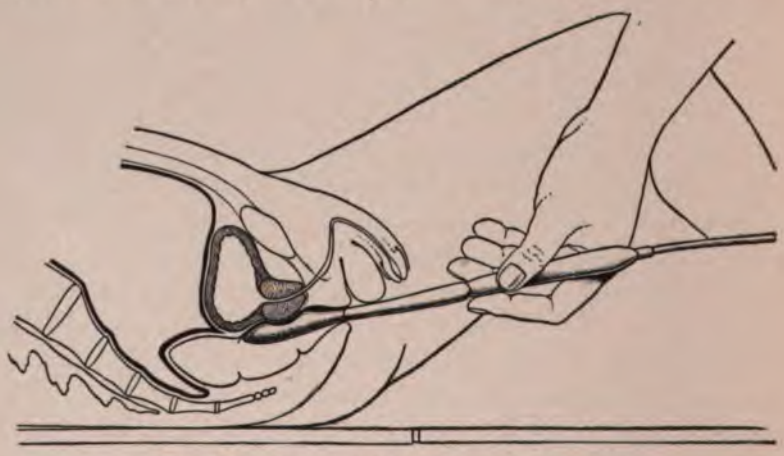


FIG. 596.—ELECTRICITY BY RECTAL ELECTRODE.

In any case of prostatorrhea, in which no prostatitis is present, the urine is clear; but after massage of the gland the next urine passed will be cloudy with perhaps masses of coagula from the prostatic ducts; whereas, if prostatitis is present, the urine will be turbid with masses of inflammatory detritus. The degree of cloudiness and turbidity, as well as the amount and character of the material expressed from the prostate by massage, vary greatly in different cases.

**Diagnosis.**—The symptoms of prostatorrhea which make the diagnosis certain are the appearance of a drop or more of an albuminous discharge, especially after straining at stool or at the end of the act of micturition. The dif-

ference between prostatorrhea due to an atonic condition of the prostate and that due to prostatitis, as well as the differentiation between it and chronic seminal vesiculitis, urethrorrhea, spermatorrhea and chronic posterior urethritis, have all been thoroughly discussed in the chapter on Discharges in the first volume.

**Treatment.**—For the mild cases, not accompanied by prostatitis, very little if any treatment is necessary. Sexual moderation, an unstimulating diet, regulation of the bowels so as to prevent hard stools and moderate exercise are sufficient to effect a cure. Massage of the prostate and prostatic douches are indicated, as already described under Treatment of Chronic Prostatitis. It is important to encourage and reassure the patient and to impress upon him the fact that he is not losing semen, and that his virility will slowly improve. Electricity in the form of high-frequency and faradic currents is often of great benefit (Fig. 596). The rectal psychrophore with cold water passing through it, is often of value to strengthen the prostate when it is atonic. When the prostatorrhea is associated with prostatitis, the treatment outlined under Prostatitis should be given.

# CHAPTER XLIX

## TUBERCULOSIS OF THE PROSTATE

**Etiology.**—Tuberculosis of the prostate is of quite frequent occurrence in cases of genito-urinary tuberculosis, its frequency in these cases being estimated by Collinet at sixty-two per cent and by Schroeder at seventy-three per cent. The active cause is the tubercle bacillus and the predisposing cause is the same as in other organs of the body—namely, congestion. This may be due to back pressure, in the case of a congenital or acquired stricture; to con-

FIG. 597.—TUBERCULOSIS OF THE PROSTATE.
Note the tubercular nodules on the prostate and vesicles and loss of tissue in the right lobe.

stant sexual excitement; to excessive coitus; or to chronic prostatitis. Chron constipation also favors its development.

The disease is rarely primary; but in the great majority of the cases it secondary either to renal tuberculosis, due to infection with tuberculous uri flowing through the prostatic urethra, or to extension of tuberculous epidid mitis along the vas deferens. It appears to be certain that infection may occ

by the hematogenous route, as well as directly by the urinary route, or through the ejaculatory ducts.

**Pathological Anatomy.**—The disease begins most frequently in the center of the gland, and the adjacent ejaculatory ducts opening into the prostatic urethra are often involved. The tuberculous areas may be scattered over one or both lobes, or the upper or lower part of but one lobe may be involved. In most cases one lobe is involved before the other.

The size and shape of the gland varies according to the number and distribution of the tubercular nodules, which are rarely scattered over both lobes uniformly. In case they are, the entire gland is enlarged; whereas, if one lobe is principally involved, it will be found to be the larger. One lobe may be in the stage of suppuration, while the other lobe is becoming involved; or the tuberculous process may be present in but one lobe, showing tuberculous infiltration in one part and suppurative changes in another.

The tubercles in prostatic tuberculosis are made up of round, giant and epithelioid cells, and are imbedded in the chronic inflammatory tissue surrounding the acini, or follicles and their ducts, resulting in perifollicular thickenings, called nodules. When these thickened areas coalesce, the nodules become larger; if they undergo caseous degeneration, the intervening glandular tissue may be destroyed (Fig. 597). The consistence of the gland is very much greater over these nodules before they have broken down, and they are frequently very markedly indurated.

Fig. 598.—Prostate Practically Destroyed by a Tuberculous Process. Opening into urethra and bladder. (After Deanos.)

The results of the tuberculous process may be resolution; or the inflammatory thickenings liquefy, forming a puriform focus. Secondary infection also may cause tubercular nodules to break down, suppurate and discharge into the prostatic urethra or elsewhere, as in the case of follicular prostatitis; or a collection of pus cavities may drain into the urethra or very rarely empty into the bladder (Fig. 598) or rectum (Fig. 599). The cavities may later contract and cicatrize. After the abscesses have broken down, the prostate becomes smaller and irregular. Sometimes the prostate is entirely destroyed by a tuberculous process (Fig. 600).

If a cross section of a tuberculous prostate is made during the stage of
dation, nodular areas are cut through, varying in size from a French p

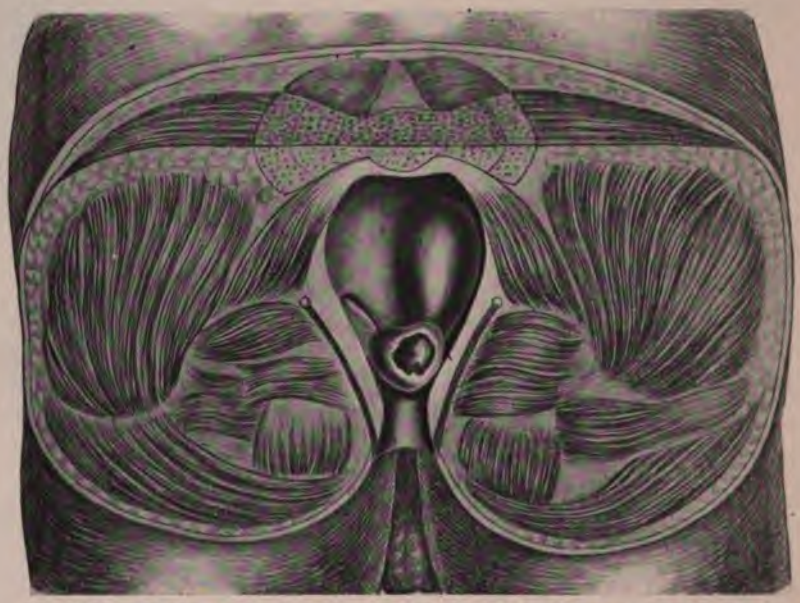


Fig. 599.—Tuberculous Process in the Prostate Opening into Rectum.

a filbert. In the same prostate and often in the same lobe, nodules ma
seen forming, others undergoing cheesy degeneration, and circumscribed
of pus and abscess ca
with sinuses leading
the urethra. In auto
it is not uncommon to
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in other organs have u
gone retrogression, wh
they have persisted in
prostate. The gland s
to act as a reservoir fo
tubercle bacilli. Many
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come to autopsy with c
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tients in whom nothin
normal had been f
during life on clinica
amination of the pro
In other cases, it may

Fig. 600.—Complete Destruction of Prostate.

been possible to demonstrate an irregular enlargement, with tenderness on pressure, or fluctuation, in the course of examination of the prostate.

**Symptoms.**—One of the symptoms of tuberculous prostatitis is frequency of urination. This may be slight; but if the tuberculous process invades the region of the vesical sphincter, it becomes more marked. In cases in which the prostate, through its enlargement or its stiffness, interferes with urination, especially where the bladder itself is involved in the tuberculous process, the frequency and the accompanying tenesmus may be very great. Pain and burning are usually present, although they vary in degree. The burning may be slight or marked, depending on the acuteness of the prostatitis, through its mixed infection. Pain is slight at first, but becomes more severe as the disease advances and when the process has reached the urethra. It is more marked in the deep urethra, but may also be present in the glans, especially during urination. There may likewise be pain on ejaculation during coitus and nocturnal pollutions. There may be bleeding before or after urination when there are tuberculous ulcers in the posterior urethra. The tenesmus is usually slight, although it may be marked when ulceration is present in the vicinity of the bladder sphincter. I do not remember any case in which there was retention of urine, requiring catheterization. The passing of the catheter is sometimes necessary to treat the bladder when it is also affected. This is at times extremely difficult and occasionally impossible without an anesthetic, on account of the spasm of the cut-off muscle in its effort to protect the tender posterior urethra. It might also be said that a tuberculous prostate of large size predisposes to tuberculosis of the bladder in cases in which the kidneys are affected, on account of the obstruction that it causes; besides which, the extra strain brought to bear on the bladder tends to aggravate the symptoms. Occasionally the vesical sphincter is involved and its function destroyed by the abscesses, in which case incontinence of urine may result. In certain cases rectal symptoms are prominent, such as a frequent desire to defecate whenever fecal matter presses on the prostate, together with pain and rectal tenesmus on defecation.

**Examination and Diagnosis.**—Examination by rectum may show a general enlargement and induration of the entire prostate, or of one lobe; or it may be larger and harder than normal in certain areas represented by nodules. The nodules may be tender to the touch or but slightly sensitive. As the case progresses, a nodule may slowly become smaller and disappear, or it may soften and disappear and leave a depression. In the first instance, the nodule may have undergone resolution, or it may have also broken down slowly and the outer wall of the exudate may have softened and resolved. Occasionally, we can feel an area of fluctuation of fair size, with a well-outlined wall about it. The same prostate often depicts to one, by the finger touch through the anterior wall of the rectum, hard nodules, softenings, fluctuating areas and depressions

resulting from the breaking down of abscesses. (See Fig. 597.) Sometimes, but rarely, abscesses break into the rectum. These conditions correspond closely to the follicular abscesses that have been already treated of, only the process is slower and the nodules are harder and more sharply defined.

Discharge in tuberculosis of the prostate is often present, resembling that of a chronic gonorrheal urethritis, but with no gonococci and considerable detritus. If the patient has a chronic gonorrheal urethritis during the development of the process or has had one shortly before this, it may be considered due to the gonococcus; but if the patient has no history of a urethral infection at any time, the discharge may be more carefully considered and may be found to be a part of a tuberculous process, either of a catarrhal or of a suppurative character. The tubercle bacilli can usually be found in the pus after abscess formation or when pus is present.

The urine in tuberculosis of the prostate is normal at first, in the absence of a gonorrheal or tuberculous urethritis; but after abscesses have broken down and discharged into the urethra, there may be a quantity of thick pus shreds passed in the urine for some time.

The DIAGNOSIS depends on the symptoms and examination, showing the evidences of prostatic involvement already mentioned. The diagnosis is strengthened by the presence of lesions of the epididymis, the ampulla of the vas, or the seminal vesicles, resembling those of tuberculosis, and is confirmed by the findings of the tubercle bacillus in the discharge, or shreds in the first urine.

It must be differentiated from an acute follicular gonococcal prostatitis. A tuberculous prostatitis is much more chronic than is an acute follicular prostatitis. The temperature usually is normal or but slightly elevated. Of course, there are exceptions in which the constitutional symptoms may be more marked in a prostatic tuberculosis than in a follicular case, but this is very rare.

The finding of the gonococcus does not always exclude the diagnosis of tuberculosis in a patient with a gonorrheal history, as it may have been a predisposing cause of the tuberculosis. The finding of the tubercle bacillus would, however, be positive.

In cases of tuberculous and follicular prostatitis, the rectal feel may at times be very similar in the irregular outline of the prostate, and, after abscess formation and discharge, the irregular outline of the gland may be the same. (See Figs. 576 and 597.)

I have seen cases of tuberculous prostatitis in which both lobes were enlarged symmetrically and the surface was hard but not nodular. Later both lobes were nearly destroyed by an abscess. In the tuberculous prostates that are smooth and generally enlarged, there is often a sharply defined edge at the base of the prostate. I have seen a case in which the whole of one lobe was enlarged, smooth and fluctuating, and the patient was without symptoms of tuberculosis of the prostate. The abscess broke into the rectum while he was

in the hospital. The patient then went away and, on his return some months afterwards, it was found that the affected lobe had been practically destroyed, although there was considerable fibrous thickening left (Fig. 599). It is probable that if the abscess in this case had opened into the urethra, it would have been followed by more urinary symptoms.

In a general way, it may be said that a nongonorrheal chronic prostatitis, associated with a purulent discharge from the urethra without other inflammatory symptoms, is always suspicious, and an examination of the discharge for the presence of tubercle bacilli should be made.

**Prognosis.**—This disease is a serious one, because in the majority of cases it appears secondarily, and is a sign of the presence of advanced tuberculosis elsewhere in the body. The patients usually succumb to pulmonary phthisis, or are carried away by miliary tuberculosis. When there is marked involvement of the kidney, the clinical picture may terminate in the symptoms of fatal uremia. I think, however, that at the present writing, we understand the treatment of these cases better than formerly and can make an earlier diagnosis. I am sure that, in the past, many cases were overtreated, and also that they were treated for other conditions than tuberculous prostatitis. The prognosis of tuberculosis of the prostate is also serious from the point of view of sterility, as the amount of prostatic secretion may be lessened or altered and the ejaculatory ducts and vas deferens may be rendered impervious.

**Treatment.**—The treatment of tuberculosis of the prostate is specific and symptomatic. The specific treatment is creosote, the sirup of the hypophosphites and the sirup of the iodid of iron internally. Carbonate-of-creosote capsules are given in three-grain doses three times a day, after meals, and the sirup of the iodid of iron, fifteen minims, three times a day, between meals.

Locally there is no treatment, excepting hot rectal douches of salt solution. I have occasionally given gentle massage of the prostate, but I am doubtful if it is of benefit and it may do harm. I do not feel that I can recommend it. Instillations of gomenol (twenty per cent) or argyrol (ten to twenty per cent), or iodoform emulsion (ten per cent) into the posterior urethra, should be tried, beginning with one quarter of the strength mentioned. The best remedies are hygienic measures, a change of climate, a nourishing diet of simple food, plenty of sleep, only a moderate amount of work and plenty of fresh air.

Surgical interference is of great value in dilating or cutting any narrowings that may be present in the anterior urethra until a normal size has been obtained. Care must be taken not to dilate the posterior urethra as well, as it will only aggravate the trouble. Surgical interference is also indicated in opening and draining abscesses that may point to the perineum. Later on, after the process has exhausted itself, a perineal section can be made and the prostatic urethra stretched with the finger, in case it is contracted, as it frequently is.

## CHAPTER L

### PROSTATIC HYPERTROPHY

**Etiology.**—The theories of the causes of prostatic hypertrophy are m The first reason assigned for this condition is that it is due to senile fibr Such a process does occur, though rarely.

Next comes a series of theories which are purely suggestive and ca be borne out by investigation, namely: That it is due to sexual excess; to gratified sexual desire; to perverted action of the testes; to an attempt on part of nature to counteract the pouching of the bladder accompanying muscular degeneration; or to a change normal to advancing years. Such ditions may be contributing or predisposing causes or factors of hypertro but they are not the important ones giving rise to this condition.

Again, it is thought that it is due to a chronic inflammatory process or septic catarrhal process. Both of these theories point to the inflamma origin of hypertrophy and offer the opportunity for much scientific work. first of these theories has been advocated by Ciechanowski and Greene Brooks. The latter two authors have made exhaustive research work on subject, but the investigations of all three, while much praised, have not l accepted.

The last theory is that it is due to a neoplasm. This is the one that app to me the most, especially as the increasing number of malignant growths I have found in my prostatic work point to this gland as one conducive to growths. The presence of enucleable tumors and the microscopical findings l strengthen my belief that the cases of so-called hypertrophy of the prostate benign neoplasm. This theory is approved by the French School, which cla for it the same reason as for the development of new growths elsewhere in body. Wallace says that the neoplastic theory accounts satisfactorily for observed facts found in most cases of enlargement of the prostate.

**Pathology.**—The following pathological descriptions have been ta mainly from the work of Cuthbert Wallace, whose descriptions appear to m be most comprehensible. No constant relation exists between the size of organ, the alteration of its external configuration and the histological chan There is a general tendency in the process of growth for the gland to lose pyramidal shape, to increase in antero-posterior diameter and to bec

globular. Its external surface is generally smooth and seldom presents excrescences such as may be seen in the vesical aspect of the gland. An increase in

FIG. 601.—EXTRAVESICAL ENLARGEMENT OF THE PROSTATE. A section through the junction of the bladder and prostate. The adenomatous change is well marked. The area of the bladder supported by the prostate is of greater extent than normal. There is a slight invagination of the vesical floor and a thinning of the muscle about the internal meatus. (Natural size.) (Wallace.)

transverse diameter causes it to assume a close relationship to the pelvic floor and its walls. In front, it approaches the pelvic ramus; laterally, it bulges out the levator ani muscles; and behind, the rectum. An increase in the vertical diameter may be extravesical, intravesical, or both. An *extravesical* enlargement is one in which the gland is enlarged below or outside of the bladder and causes an increase in the vertical diameter below the bladder and thus in the distance of the bladder floor from the triangular ligament. The vesical diameter is greater, as the base of the gland supporting it is wider (Fig. 601). An *intravesical* enlargement is one in which there is considerable projection

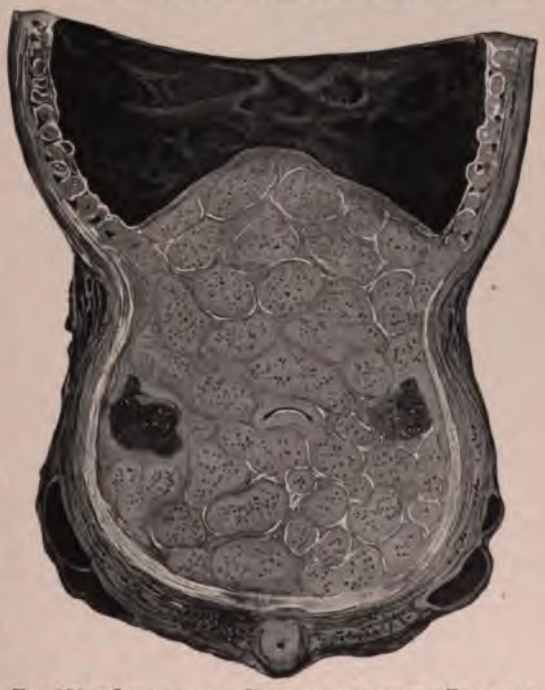


FIG. 602.—INTRAVESICAL ENLARGEMENT OF THE PROSTATE. A coronal section through the prostate and bladder. The prostate has grown into the bladder, and widely separated the sphincter. The floor of the bladder has been raised to an extent corresponding to the distance between a line drawn through the bottom of the vesicoprostatic groove and the cut edge of the mucous membrane. (Natural size.) (Wallace.)

into the bladder (Fig. 602). The urethra opens near the summit of the at a distance from the bladder floor; the distance above the bladder may be considerable. The part is often formed like a t rounded ring. If it increases all sides, it assumes the form if unevenly, then the projectio very irregular, and should the part grow more rapidly, the t dian) lobed tumor (Fig. 603) found.

FIG. 603.—ENLARGEMENT OF THE PROSTATE. A median sagittal section of bladder and prostate. Immediately behind the internal meatus and under the mucous membrane is a small isolated adenoma. It is marked off from the rest of the organ, and is the only part affected by pathological change. (Natural size.) (Wallace.)

A good description of th of development of an intravesi is given by comparing a prost external fibrous capsule with or "pop-over." In making t dough is put in a small tin c ing to the lower half of a tin c a baking ring. As the bak place, the dough increases i It is prevented from extendi ward on account of the botto tin, or laterally on account c yielding walls, and it therefo upward until it comes to the tin or above it, when it stops tance above the level of the tin, a variety of shapes, or else h the side. In the case of the p which the ligaments and fasciæ about it are unyielding, it cannot g ward on account of the triangular ligament, or forward on a the triangular and pubo-prostatic ligament, or laterally on accou thick external capsule. Consequently, it grows up in this cuplike in the line of least resistance, which is along the urethra, until it prot the bladder beneath the submucous coat, assuming different shapes i individuals. Generally, the two lateral lobes are crowded togeth forming a protrusion that is called the middle lobe. There is also a angular or true middle lobe, but this is usually not as much the ca obstruction as the two middle lobes that are crowded together in t the gland above the ejaculatory ducts. Sometimes a small third l nected with an interlobular band of tissue between the lateral lobes away with it. (See Figs. 613, 614, 615, 616, 617 and 618.)

Alterations in the position of the internal meatus are important. Normally, the meatus is a dimple in the lowest part of the bladder, surrounded by a ring of muscle. In hypertrophy it generally remains in the median line, but is raised by the intravesical projection, sometimes 2 or 3 cm. or more, and points forward and assumes a funnel shape (Fig. 604).

As the prostate grows into the bladder in intravesical growths, the bladder sphincter is displaced as follows: The growth first causes an alteration of the sphincter close to the internal meatus; adenomatous tissue takes its place; the sphincter gradually is pushed farther away from the meatus as the adenoma increases in size, until it may be an inch or more distant, forming a collar about the adenoma, and in such a position that in contracting it does not compress the meatus, but the adenomatous tissue some distance below it.

Fig. 604.—Enlargement of the Prostate, Showing the Position of the Meatus. A sagittal section of the prostate and bladder. The internal meatus has been carried forward. The urethra is distorted, so that the portion proximal to the openings of the ejaculatory ducts lies at a right angle with that portion beyond the openings of these canals. The prostatic tissue below the ejaculatory ducts has escaped the adenomatous transformations. The two adenomatous masses above and below the urethra are quite continuous with each other. (Natural size.) (Wallace.)

The alterations in the urethra are many: (1) Its length is increased, whether it be intra- or extravesical. (2) The alteration in the axis depends upon the position of the growth. The commonest alteration is an increase in the antero-posterior angle, due to increase in size of the part of the gland above the ejaculatory duct, causing the proximal portion of the urethra to be pushed forward. In extreme cases the proximal and distal portions of the prostatic urethra may be at right angles to one another. The urethra may also be deflected either to the right or left. (3) The function of the urethra is influenced by the growth. At about the middle of the prostatic portion it usually forms a line or slit, which may be easy of dilatation, yet the capacity of the canal for the fluid passing through it is not so great, owing to the sides being kept in apposition by the surrounding growth. (4) The region immediately about the prostatic urethra usually contains but little gland tissue; but one of the earliest changes noted in the enlargement of the gland is that the glandular tissue begins to crowd close to the urethra just under

the muscular layer which it replaces, and then against the mucous membrane which becomes attenuated. In cases of marked hypertrophy, the most superficial incision, or sometimes even a slight dig with the handle of the scalpel or the end of a dull bladder scissors over it, opens it and reveals the internal capsule.

The effects produced by enlarged prostate on the urinary tract above it, in consequence of its growth, is first shown in the bladder. There is hypertrophy

FIG. 605.—ENCAPSULATED OR ADENOMATOUS FORM OF PROSTATIC ENLARGEMENT. Shows the early appearance of the white areas. They are ill defined. (Natural size.) (Wallace.)

FIG. 606.—ENCAPSULATED OR ADENOMATOUS FORM OF PROSTATIC ENLARGEMENT. The white areas have appeared immediately in front of the urethra. The posterior part of the gland is unaffected. (Natural size.) (Wallace.)

of the muscular coats leading to trabeculation and at times to development of diverticula. As the obstruction advances, the bladder becomes more distensible, and no more urine can be held without discomfort, although the walls are still thicker than normal. A posterior pouch, in which residual urine accumulates, next develops behind the hypertrophy, due to the prostate growing upward and forward into the bladder, whereas the bladder floor behind it remains at the same level as before the growth took place.

FIG. 607.—ENCAPSULATED OR ADENOMATOUS FORM OF PROSTATIC ENLARGEMENT. The white areas have the appearance of definite tumors, which are situated near the urethra. The outer portion has lost its normal texture, and the fibers run concentrically. Calculi and a small white mass indicate the presence of glandular elements in this situation. (Natural size.) (Wallace.)

We will now take up the consideration of the two forms of prostatic enlargement, the *encapsulated* or *adenomatous*, and the nonencapsulated or the fibrous or diffuse.

In the *encapsulated* or *adenomatous* form of prostatic enlargement, the first change observed macroscopically is the presence of opaque areas in the normal spongy tissue of the prostate, provided gland tissue be present (Fig. 605). These white areas gradually increase in size while others make their appearance,

until the difference between the white areas and the normal gland substance is quite apparent. Changes in the stroma are now noticed, its strands being replaced by the developments between them. The white areas increase in size irregularly and they tend to crowd together and approach the urethra (Fig. 606) rather than the capsule. At the same time the uninvaded tissue loses its spongy character and appears denser. As the disease advances, the white areas take on the appearance of distinct tumors (Fig. 607), consisting of a number of smaller tumors surrounded by a capsule. The peripheral part of the organ, except at the posterior-inferior portion of the gland, loses all appearance of normal prostatic tissue and shows signs of concentric lamination, in which area the ejaculatory ducts can often be seen (Fig. 608). The thickness of this outer area varies, often measuring as much as 1 cm. in places. A stage later, a transverse section shows a central area about the urethra and, surrounding it, a fibrous laminated envelope. The central portion is made up of a series of small, enucleable, whitish-yellow tumors and between them fibrous tissue running in every direction and encircling them, while the outer laminated sheath is much decreased in thickness (Figs. 609, 610).

Fig. 608.—Encapsulated or Adenomatous Form of Prostatic Enlargement. Transverse section of half a prostate. The urethra lay to the extreme left edge of the picture. A definite tumor is seen surrounded by a fibrous envelope. A bristle has been placed in one of the ejaculatory ducts. No. 4312, Royal College of Surgeons. (Natural size.) (Wallace.)

Microscopically, the sections made from these yellowish-white tumors show them to be largely composed of glandular tissue lying in a fibro-muscular

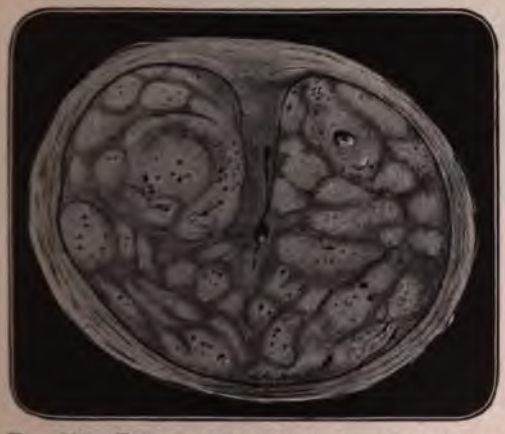


Fig. 609.—Encapsulated or Adenomatous Form of Prostatic Enlargement. Cross section. (Natural size.) (Wallace.)

Fig. 610.—Encapsulated or Adenomatous Form of Prostatic Enlargement. Cross section. (Natural size.) (Wallace.)

stroma. In some instances it differs but little from a normal gland. Occasionally, an alveolar space is filled with epithelial cells (Fig. 611).

The *nonencapsulated* form of enlarged prostate is spoken of also as fibrous or diffuse, but the nature of the prostatic change has never been satisfactorily

FIG. 611.—MICROSCOPIC SECTION OF A SMALL ENCAPSULATED TUMOR REMOVED FROM A LARGER TUMOR ENUCLEATED FROM THE PROSTATE. (Wallace.)

determined. It occurs in about fifteen per cent of cases. They cannot be satisfactorily enucleated and have to be removed in pieces.

Microscopically, they can be divided into two classes: In the first, the growth differs but slightly from the encapsulated form. The proportion of fibrous and muscular tissue is about normal. In the second variety, which is much rarer, the changes are more marked and but little resemblance to the normal gland is seen. The gland tissue is altogether atrophied. The alveoli are not compressed or flattened so much as shrunken (Fig. 612).

Wallace says:

"The epithelium present in the lumen of the alveoli takes the stain very badly, and is evidently degenerated in a marked degree. The stroma, which occupies nearly the whole field, shows bundles of fibers, often massive, which interlace in a most intricate manner. Proper staining shows these bundles to consist of muscle fiber, which is thus demonstrated to form a large proportion of the growth. Signs of inflammation are as wanting in this as in

the other form, and it has not been possible to demonstrate anything at all approaching scar tissue. It is possible that these two varieties of the nonencapsulated form are only the extremes of a similar process, since the intermediate forms seem to exist and to show varying amount of gland tissue and stroma. There is considerable difficulty in stating what are the naked-eye appearances of the prostates from which these two varieties have been removed, and no opportunity has occurred of examining such a case after prostatectomy.

"If recourse is had to postmortem specimens, some light is gained. It is not unusual to meet with cases of prostatic enlargement of moderate dimension and slight intravesical projection, in which the cut surfaces show white or yellow areas such as have been described as occurring in the early stages of the adenomatous variety. The gland seems more evenly affected, and there is little or no sign of encapsulation. There may be a small enucleable mass in

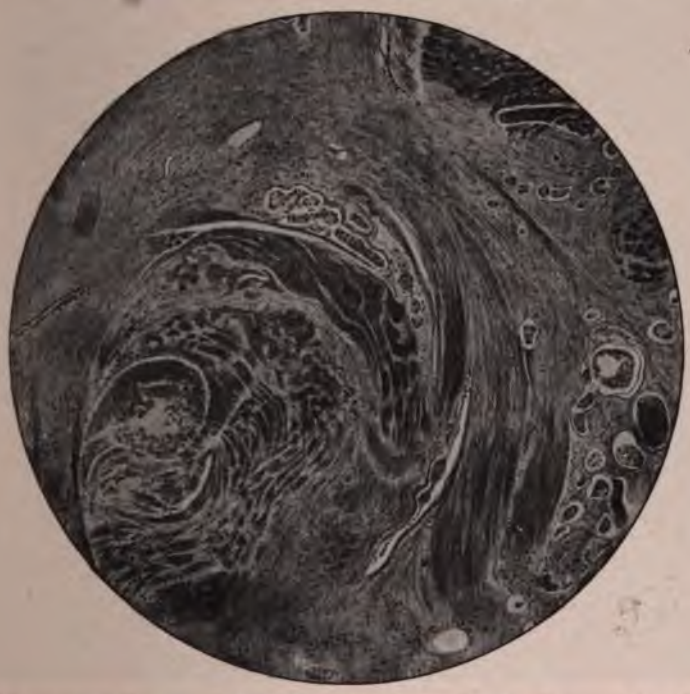


FIG. 612.—A MICROSCOPIC SECTION TAKEN FROM A PORTION OF TISSUE REMOVED BY A MORCELLEMENT PROSTATECTOMY. The enlargement was exceedingly tough and showed no signs of encapsulation. The darker wavy bundles are composed of plain muscle fiber. The lighter staining material is fibrous tissue. The remains of shrunken glandular alveoli are to be seen. (Wallace.)

some cases, but there is no sign of the formation of any circumferential 'main capsule.' The cut surfaces of some of the fragments removed from the prostates by *morcellement* show similar yellow-and-white areas, and occasionally small enucleable tumors. It is possible, therefore, that the nonencapsulated forms are of the same nature as the encapsulated, but the encapsulation has

become more complete in the latter, because there has been a more rapid growth of certain of the tumors, while in the nonencapsulated variety the change has affected the whole gland to the same degree.

"An examination of a large series of prostates would seem to support this view. It is possible to place at one end of the series a distinctly encapsulated tumor, and at the other a distinctly nonencapsulated enlargement, and yet to fill the space between these two extremes with gradually changing forms. The nonencapsulated forms may be likened anatomically to the diffuse adenomyoma of the uterus, in which the myometrium may be, for wide extents, the seat of a glandular growth arising in connection with Wolffian tissue."

The prostates after enucleation have an ovoid shape or that of an egg cut in two transversely in the middle, with an irregular finish to the upper or cut surface. They usually come away either as two lateral lobes, a small middle lobe being adherent to one, or as two lateral lobes followed by an intermediary band, thickened at its upper extremity, corresponding to a middle lobe. The middle lobe giving rise to the obstruction is usually not a distinct lobe but a protrusion forward into the bladder due to the crowding together of the two lateral lobes. When the lobes are put together with a catheter between them, all prostates resemble one another quite closely, excepting in their upper pole.

Fig. 613.—Prostate Weighing 14¾ Ounces, Removed in Toto by Author. Considered the largest removed in this country. Lateral lobes held together in front by attachment.

**Symptoms.**—The troublesome symptoms of prostatic hypertrophy which are the beginning of the end, rarely begin before the age of fifty-five; but before this time, certain symptoms are often noticed that are annoying and that disappear, but come on again when the actual trouble begins. I am in the habit of calling this grouping of symptoms in my lectures the "preprostatic stage."

The *preprostatic stage* of prostatic hypertrophy may come on a number of

years before the hypertrophy actually takes place, often between forty-nine and fifty-one, or forty-eight and fifty, or even younger. The patient has attacks of frequency of urination, burning, with perhaps some tenesmus and pain, that are quite out of proportion to the condition of the bladder. In these cases, the cystoscope shows the prostatic base to be somewhat enlarged and congested, and the blood vessels of the bladder base more prominent. The blad-

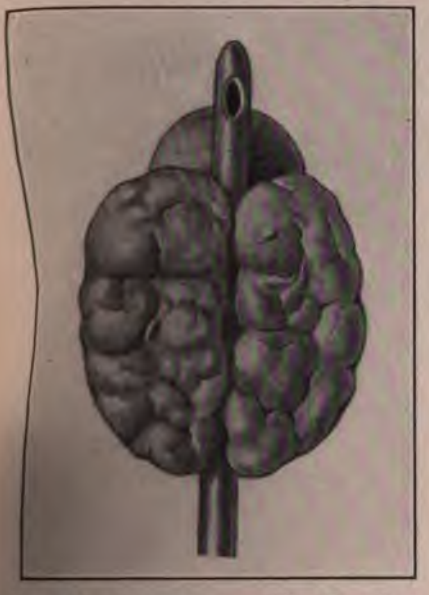


Fig. 614.—Prostate with Two Long Lateral Lobes and an Upward Bulging Above in the Center.

Fig. 615.—Prostate with an Almost Round Lateral Lobe on the Right, and a Round Lobe in Front on the Left, with a Long Attachment Behind It.

der is usually congested and sometimes inflamed. There is generally some trabeculation and a small amount of residual urine, from a drachm to half an ounce. I am inclined to believe that certain changes of prostatic hypertrophy begin at this time, but that the external capsule yields somewhat and the bladder becomes more tolerant, thus relieving the symptoms which do not recur until the age of fifty-five or over in the majority of cases.

The *prostatic age* can then be considered as fifty-five or over, and, as the patient approaches this time of life, his prostatic symptoms begin to manifest themselves more persistently. They are frequency of urination, burning and tenesmus; a sense of fullness over the bladder; a feeling of pressure in the perineum or in the suprapubic region; a feeble stream, difficult urination, retention of urine, dribbling or incontinence.

*Increased frequency of urination* is due to the bladder irritability accompanying a congestion. It may also be due to a certain amount of residual urine

being constantly present in the bladder that he cannot pass out on account the obstruction and therefore he must void more frequently. It can easily seen that if a patient voids 48 ounces of urine in four acts of micturition, will pass 12 ounces each time and he will feel the desire to urinate when ounces are present. If he has 6 ounces of residual urine always remaining the bladder after urination, whenever 6 ounces more enter the bladder, maki 12 ounces, it will feel full, giving him the desire to urinate; but he will be al to void but 6 ounces, as the remainder cannot be passed, on account of the struction, therefore he must urinate eight times a day instead of four tim in order to pass 48 ounces of urine, which will be twice as frequent.

*Burning on urination* is due either to congestion or inflammation of t bladder, especially in the trigone. Either very acid urine or ammoniacal uri is irritable in character and giv rise to frequency.

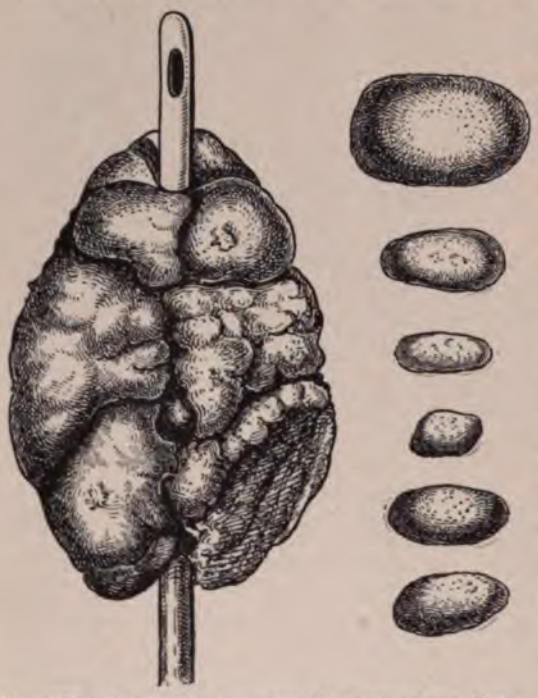


Fig. 616.—Long, Cone-shaped Hypertrophied Prostate of Very Irregular Outline, together with Vesical Calculi Removed at the Same Operation.

*Night frequency* of urinati is usually a more marked sym tom of prostatic hypertrophy th day frequency. As a man n mally passes urine five times a d and none at night, six times a d would therefore be frequency, a once at night would also be f quency. By day I mean the s teen hours that he is up and abo and by night the eight hours th he is in bed. If a patient urinat seven times a day and thr times a night, his night frequen would be relatively greater th his day frequency, as by d the number of micturitions wou be but two more than norm while by night there would three more. The reason why nig frequency is greater than day f quency, is because during the day, when the patient is up and walking about, t perineal circulation in which the prostatic plexus takes a prominent part is mo active; but at night when the patient is quiet, the circulation is more sluggi in the prostatic plexus and consequently in the vesical veins that form a pa of it. The resulting passive congestion at night makes the sensory nerve te minals in the bladder more sensitive and, when a small amount of urine acc mulates, a feeling of *fullness* results and a desire to void, which awakens hi

In patients in whom there is a considerable amount of residual urine, there may be present not only a feeling of fullness but also one of *pressure*, and the frequency of urine is increased. Night frequency first shows itself by the patient awakening an hour or so before the usual time of arising, with a feeling of fullness and a desire to urinate. As the trouble advances, instead of arising an hour or so before his usual time to urinate, he will do so two or three hours earlier and, still later on, about four hours earlier, thus bringing the time to the middle of his sleeping hours. Shortly afterwards he will probably begin to arise twice a night, say three hours and six hours after retiring, and a little later three times at night.

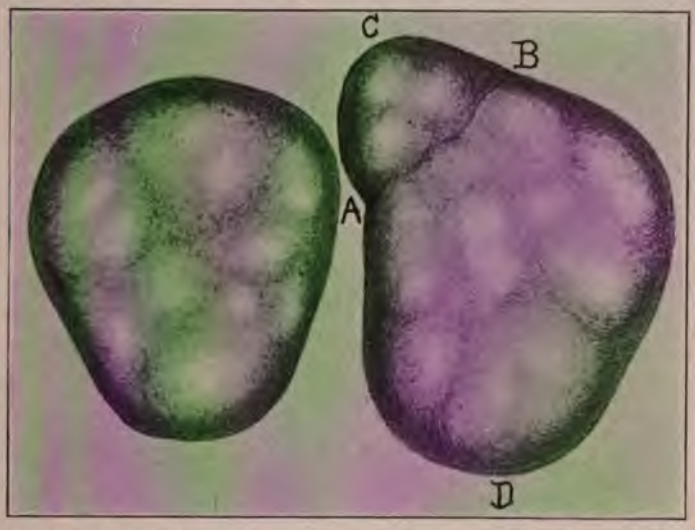



FIG. 617.—TWO LATERAL LOBES OF THE PROSTATE. The line *A B* is the line of demarcation between the left lateral lobe *A B D* and the attached middle lobe *A B C*. When these two lateral lobes are placed side by side with a catheter between them, the gland resembles in shape the others that we have just seen.

A prostatic usually urinates in this ratio six times a day to once at night, seven times a day to two or three times at night, eight times a day to four times at night. Nine or ten times a day and five times at night occurs only in marked cases.

*Urinary hesitancy* is another symptom of prostatic hypertrophy, and is probably due to the change in bladder contraction necessary to start the stream through the altered channel.

The *feeble stream* in prostatic hypertrophy is due to the obstruction met with in the prostatic urethra by the enlarged gland pressing upon it with only the force of the stream to push back its walls. It is also due to the peculiar curve in the mid-prostatic portion of the urethra that it has acquired in consequence of the hypertrophy. (See Fig. 604.) In most cases of long standing, however, the feeble stream is due to atony of the bladder wall and is almost as evident when the urine is running through a catheter inserted into the bladder.

*Dysuria*, or difficulty in urination, is due to the obstruction above mentioned and, in order to urinate, the patient frequently has to bring his abdom-

inal muscles and even his diaphragm into play in an effort to help the blad expel its contained urine.

*Retention* is the inability on the part of the patient to void all of his ur spontaneously, that is, without the aid of a catheter. A patient may h complete or partial retention. If he has complete retention, he cannot p any of his urine. A patient may have either acute or chronic complete ret tion. An *acute* attack of *complete retention* is often the first danger signal t a patient has of a hypertrophic process going on in his prostate. It usu comes on after postponing the act of micturition when he has the desire, account of not being in a suitable place to urinate. Overeating and drink or exposure to cold and wet may favor such an attack. It is accompanied pain and a sense of fullness and pressure in the suprapubic region. After patient has been catheterized one or more times, and he has had a few hot baths, a liquid diet and a diluent, he will again be able to urinate spontaneous but will not be able to empty his bladder fully.

*Chronic complete retention* is a condition in which a patient, after hav an acute attack of retention, is never able to urinate again without the aid a catheter; or wl he gradually beg to urinate less less, with grea and greater frequ cy, until he fina cannot urinate at

Fig. 618.—Two Lateral Lobes of the Prostate with a Small Middle Lobe and Tissue from the Posterior Commissure Between Them.

*Partial retent* is a condition which a patient c not fully empty bladder. In ot words, a patient w residual urine is patient with part retention. If t quantity of resid urine in partial retention continues to increase, it will gradually result in c plete retention or overflow retention, that is, retention with incontinence. W a patient with gradually increasing residual urine has an attack of acute ret tion, and catheterizing shows that he has from twelve to fourteen ounces residuum and this does not decrease, he can be put in the class of complete tention as far as the outcome is considered, as he will either have to be opera on or lead a catheter life. If neither one of these procedures is resorted to, may die of acute retention with hydronephrosis of both kidneys and uremia;

the probabilities are that his bladder will dilate and stretch the bladder sphincter by its fluid weight to a sufficient degree to give rise to dribbling of urine and then incontinence. His bladder and urethra then assume the form of a funnel into which the urine from the kidneys pours, and the urine from the urethra in turn empties in his clothing unless some suitable urinal is worn.

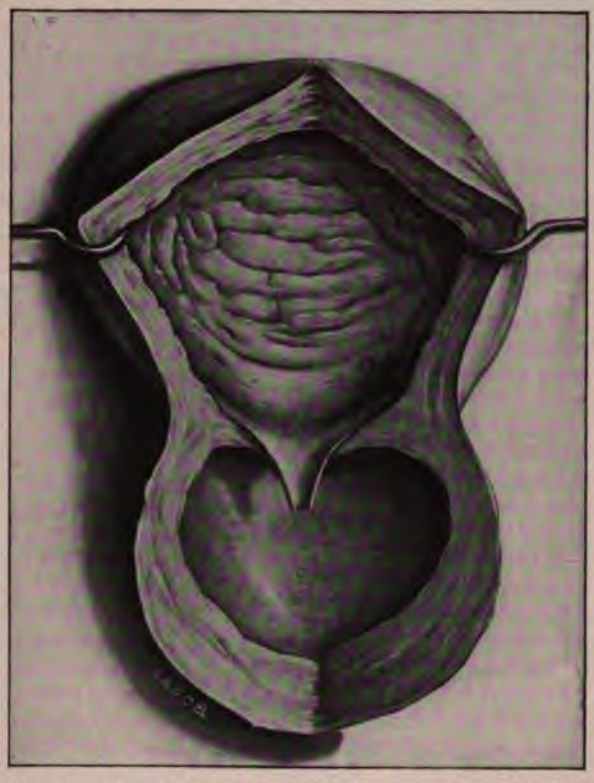


FIG. 619.—THICK LOGE FROM WHICH PROSTATE HAS BEEN REMOVED. The walls of the external capsule were nearly ¾ of an inch thick in places.

**Examination and Diagnosis.**—The examination in the case of a man fifty-five years of age, or thereabouts, with the symptoms that have already been described is threefold: First, to determine if his prostate is enlarged, and if so, the variety of the enlargement; second, to determine any other condition that may be present; third, to learn the condition of his bladder and kidneys.

Bearing in mind from our pathological chapter that hypertrophied prostates are of two principal forms, extra- and intravesical, with the characteristics of each, as well as the symptoms that have just been enumerated, we are in position to begin the examination which is one of routine.

1. External abdominal, kidneys, bladder and genitals.
2. Urine. Rectal, standing or lying (bimanual).
3. The lower urinary tract. Urethra for obstruction, distortion, length.
4. The bladder. Residual urine. Cystoscope—base of prostate, contents of bladder interior.
5. The kidneys.
6. General condition.

EXTERNAL EXAMINATION.—Prostatic hypertrophy gives rise to obstruction of the urinary flow and for this reason, in most cases, to involvement of the bladder and kidneys due to back pressure. At the same time, in many cases

with prostatic symptoms, there may be certain conditions in the abdomina pelvic cavity that would give rise to bladder disturbances that might cl resemble those due to hypertrophy. The patient should be placed in a d position on the table, with the shoulders slightly elevated and the lowe tremities at full length or with the knees flexed, as is indicated. The abd should be palpated centrally and in the line of the colon from the right around to the left iliac fossa. The kidneys should then be palpated. A largement on both sides would indicate uronephrosis, rare in prostatic h trophy, or more probably a pyonephrosis on one side and a pyelo-nephrit the other. Kidney enlargements in prostatic hypertrophy, or in men with der symptoms who have arrived at the critical age, usually point to a p nephritis or pyonephrosis due to the prostatic obstruction, or to a calcul the renal pelvis, ureter or bladder.

The hypogastric or suprapubic region is then palpated to see if the der is dilated, such as frequently happens in prostatic cases, even before have had the first attack of retention. There may be slight dullness ove pubes and the rounded top of the bladder may be felt. If the patient is s ing from retention of urine at the time, the rotundity of the bladder ma felt halfway to the umbilicus or even higher up. There may be, on the hand, scarcely any residual urine in a case of prostatic hypertrophy, marked urinary symptoms, in which event the examination of the hypog region would be negative; or there may be no prostatic hypertrophy pr and yet some interference with the bladder function from stricture, s sclerosis or some outside condition, such as a prolapsed sigmoid or a hy cyst; or the pulling on the bladder by adhesions, due to an old infla tory condition in the appendix or elsewhere would give rise to prostatic s toms. Outside influences on the bladder are not so common in men women.

The external genitals should then be palpated, but such an examin would have but little influence in diagnosticating hypertrophy of the pro excepting as an argument against it in case the testicle appeared to be t culous. Acute attacks of epididymitis are quite common in patients wh leading a catheter life, but I have never heard of such a case in a pro whose urethra had not been subjected to instrumentation.

The patient is then instructed to stand and is given a glass into whi pass a small amount of urine. This is carefully examined to see if it is with no shreds, which would mean a healthy urethra, bladder and kidne far as infection is concerned; or turbid, the turbidity not disappearing o addition of acetic acid, which would probably mean inflammation of the der or kidney, especially the former if it has an ammoniacal odor. The pa should then be instructed to pass a second specimen. If this is clear, it w show that the turbidity in the first specimen was due to some urethral tr

and not to inflammation of the bladder or higher parts of tract associated with prostatic obstruction.

Rectal Examination.—The patient should then lean over, resting his hands or elbows on some object, and a rectal examination should be made. This will tell us if the prostate is enlarged, in all cases of extravesical enlargement; whereas, in most intravesical cases, it will tell us the degree of enlargement of the part presenting in the rectum, but not of the extent of the growth into the bladder, nor the degree of obstruction (Fig. 239, Vol. I). It may also reveal to us other conditions in the pelvis that interfere with the bladder function.

Examination of the Lower Urinary Tract.—The patient should then pass all the urine that he can and again lie on the table. The entire quantity of the urine passed spontaneously should be measured and registered on the

Fig. 620.—Bimanual Examination of Prostate.

history blank. If the pelvic examination of the patient standing has not been satisfactory, a bimanual examination in the dorsal position can now be made (Fig. 620). Personally, I prefer the standing posture.

The urethra should then be examined. A bougie à boule of No. 15 French should be passed down to the bulb if there is no obstruction, a No. 20 and then a No. 25 and a No. 30 should be passed. In case one of these numbers encounters a urinary obstruction, numbers smaller than this can be passed until one goes through the obstruction. The size of the number passing should be registered as that of the stricture in case a narrowing is present. A sound with

a small beak, corresponding in size with the bougie à boule that has pas through the narrowing, should then be introduced to see if it will pass throu the remainder of the canal. It usually does, for, although a prostatic hyp trophy may interfere with the passage of urine, it is easily dilatable by inst ments as its consistence is generally not increased.

A soft-rubber catheter No. 12 French is then passed through the urethra i the bladder, and in case urine escapes through its eye, the distance from eye of the catheter to the point corresponding to the external meatus will the length of the canal. For estimating the length, it is well to use cathet that are graduated on the sides with the measurements in both centimeters a inches. In case a straight soft-rubber catheter does not pass, but meets w obstruction in the posterior urethra, as it frequently does, then an elbow soft-rubber instrument of about 14 French should be used, or, this failing, elbowed woven catheter. Elbowed catheters are easier to pass than the strai instruments, as when the curved part strikes the angle of the prostatic ureth it conforms to it in such a way that the tip of the catheter accommodates its to the anterior wall of the urethra and slides by the impediment. A sm soft-rubber catheter is the best, as it is less liable to cause traumatism th other varieties. In case we want to be very careful regarding the length the urethra and to be able to judge the length of the impediment, it is advisa to introduce a stone searcher and then to turn its beak down behind the pr tate. It will then be possible, with the finger of one hand in the rectum o the rectal base of the prostate, to feel the end of the stone searcher caught o the top of the growth protruding into the bladder and thus to note the differe between the height of the base felt the rectum and in the bladder. T length of the urethra is normally ei inches and therefore anything over t in a man of fifty-five poi to an enlarged prostate.

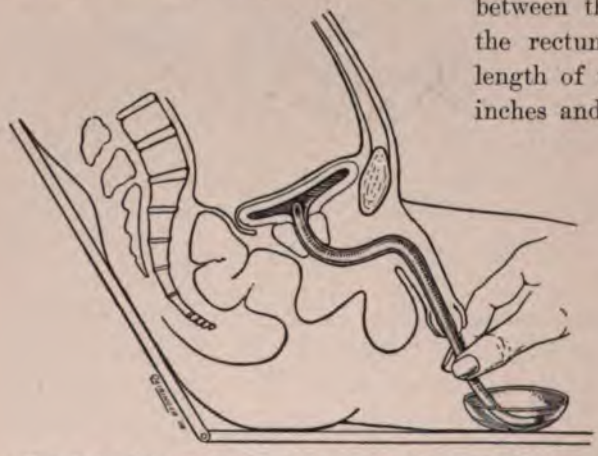


Fig. 621.—Method of Obtaining the Residual Urine.

Examination of t Bladder.—It must be membered, however, th although it is very intere ing to arrive at the leng of the urethra and amount of prostatic p trusion into the bladder, greatest importance of examination by catheter is to determine the amount of residual urine prese as this shows the degree to which the bladder is crippled. Therefore, wh the eye of a catheter is in the bladder, the urine should be allowed to esc

until it no longer runs. The patient should then be brought into a sitting posture to see if the change in position will allow more to escape (Fig. 621). The amount of urine escaping through the catheter is the residuum, or the residual urine, that the patient cannot pass spontaneously and this amount plus the amount that he passed before catheterization, makes the total amount of the bladder urine and usually gives the examiner a good idea of the bladder capacity, an important point to know in case cystoscopy or operation is contemplated. The amount of residual urine present is the index to the degree of the obstruction.

Cystoscopy should be performed at some time before a diagnosis is completed and with an indirect observation cystoscope. This should always be insisted upon, especially before advising a radical operation.

On cystoscopic examination with the beak of the instrument directed upward, the prostatic base is seen to be well rounded in hypertrophy, and in examining the remainder of its base by slowly turning the instrument, it will usually be noticed in such cases that it is necessary to push the instrument steadily farther and farther, in order to examine its base posteriorly which is constantly protruding farther into the bladder, as the posterior part of the field is approached. The surface of the base may be regular or irregular as we proceed (Fig. 622), usually the latter, and is of a bright red color. When we come to the posterior part, the protrusion is usually striking in well-marked cases, as it is often necessary to peep over the edge of the barrier in order to see the trigone and the mouths of the ureters. The trigone and the back of the bladder above it and its side should then be examined for calculi and for tumors and, if present, their appearance should be noted. The bladder wall should be examined to see if it is inflamed and, if so, its character should be noted. The presence of trabeculæ and diverticula, pointing to bladder obstruction, should also be noted.

Fig. 622.—Base of the Prostate Taken by Cystophotography.

The ureters should also be carefully observed to see if the mouths are normal or dilated, showing back pressure; to see if both are secreting, and if clear or cloudy urine is coming from them. If pus or detritus is coming from either one or both sides, it shows a suppurative condition of the corresponding kidneys.

Examination of the Kidneys.—The kidneys are the organs that play the most important rôle in hypertrophy of the prostate, as death in these cases is usually due to renal involvement. If the urine passed is clear and acid and

contains no shreds or masses of pus, it is probable that the kidneys are su gically healthy, that is, they are not infected; although they may be medical diseased in that the patient may be suffering from Bright's disease. On tl other hand, the patient may pass acid urine that is turbid with some pus; i this case, his kidneys may be both medically and surgically healthy, as all tl pus present may come from the bladder. Generally, however, when the uri is turbid in prostatic hypertrophy, the reaction is alkaline. In still other cas in which the urine is turbid, both the bladder and kidneys are involved. Wh the kidneys are involved, there may be pain in both loins. On palpation, tl renal region is usually tender and perhaps one or both kidneys may be fe to be enlarged. The urine and pus are more closely mixed than in urine fro the bladder alone. If kidney elements are seen in the urine, such as serum alb min, casts and renal epithelia, it is a further evidence of renal involvement a the same findings on ureteral catheterization tell us if one or both organs a involved.

The condition of the kidneys is of paramount importance in cases in wh a radical operation on the prostate is contemplated.

General Condition.—The general condition of the patient is also ca fully ascertained and above all that of the heart, as a fatty or a dilated he is a factor against an operation.

To sum up, then, we can say that (1) a diagnosis of enlarged prostate is d termined by the findings we have just gone over, namely, a dilated bladd as felt above the pubes; an enlarged prostate as felt per rectum; an elongate urethra; the presence of residual urine; the determination that the bladde portion of the prostate is farther up than the part felt per rectum; the vie of the bulging lobes of the prostate into the bladder through the cystoscope together with the appearance of trabeculæ and diverticula in the bladde pointing to urinary obstruction; and the presence of an enlargement of th gland by bimanual palpation. (2) Other conditions determined by the exa ination are the absence of urethral stricture, of tuberculosis of the prostate an of vesical tuberculosis, tumor or calculi. (3) The condition of the bladder determined by the urinary findings, as the presence or absence of pus and vesic epithelia in the urine, whereas the cystoscopic examination also tells us if th bladder is healthy or diseased (cystitis). Moreover, the presence or absence enlargement of the kidney, of renal elements in the urine, of clear or cloud urine seen coming from the ureters by the cystoscope and of healthy or path logical urine gathered by the ureteral catheters, would tell us if the kidne are healthy or diseased.

**Differentiation.**—The diagnosis of prostatic hypertrophy has just bee made by the symptoms and examination of the case. I will add a few word however, to show some of the mistakes that may happen, as a lesson in beha of the importance of always examining a patient thoroughly before giving a

opinion or operating. The most important principles in prostatic surgery are: Make your own diagnosis, operate on your patient and treat him after operation.

Vesical Calculus.—Vesical calculus is frequently confused with prostatic hypertrophy. I remember that fourteen years ago a patient was sent to me as a case of prostatic hypertrophy for operation. He was fifty-six years old and was suffering from frequency of urination, pain in the bladder and tenesmus. His prostate by the rectum appeared to be but slightly enlarged and he had but half an ounce of residual urine. I washed his bladder a few times, prescribed a urinary antiseptic, an antispasmodic and a prostatic diet. His symptoms abated and I sent him home, writing his doctor that I thought he could go a year or two or longer, without an operation. I did not hear from him again, and in a year and a half, wrote to his physician, telling him that I would like to see the patient again, and received an answer, saying that he had been to Germany and had had a stone removed from his bladder, since when he had been perfectly well. In this case, I erred by being too cautious and not using a metal instrument in the bladder. I should have made a cystoscopic examination and thus have had an ocular demonstration of the stone; but I was governed too much by his physician's diagnosis, the moderate enlargement of the prostate as felt by rectum, the small amount of residual urine and the extreme tenderness of his urethra and bladder, as well as by the marked improvement of his symptoms under treatment.

In another case of stone and prostatic hypertrophy, I was asked to go to a distant city and operate on a certain day. I wrote, asking to have the patient sent to me, as I would like to study him before operating. He was not sent on and I wrote for certain details concerning the case and to have a specimen of urine sent to me. I did not receive the desired details, nor did I receive a specimen of the urine, but was told that the urine was examined and was "all right." When I arrived and examined the patient, his general condition did not impress me favorably and I advised a Bottini operation rather than a prostatectomy. I performed the Bottini and made perineal drainage. The patient died and I was told later that fifteen small stones were found in his bladder. This was rather unusual, as, in doing a Bottini, the beak of the instrument was turned down and came just behind the base of the prostate and yet no stone was felt; besides which, having made my perineal urethrotomy, I put my finger tip through the perineal wound and the prostatic urethra into the bladder as a matter of routine, without detecting the calculi. In this case, I should have insisted on having the patient come on before the operation to allow me to study his case. I should have had a specimen of urine that I could submit to a pathologist who is in the habit of examining my specimens and understands the point of view from which I look on these cases. I should also have had a cystoscopic examination made before operation. I mention these two cases as illustrative of what may happen if one is governed by the diagnosis

of others and thus led to swerve from his routine methods of examination a consequent treatment. The fatality in this case had nothing to do with t choice of operation, as a Bottini operation with perineal bladder drainage less dangerous to life than is a prostatectomy.

In many other cases I have found calculi in the bladder of patients suff ing from prostatic hypertrophy, as well as in the bladders of those supposed be suffering from enlarged prostate. I have always detected them by the c toscope before the operation in all cases in which the symptoms were due their presence, when cystoscopy was performed; although I have seen othe not particularly experienced look at such calculi behind the gland and n recognize them.

In differentiating between stone and prostatic hypertrophy, we must member that in stone there is more pain, greater frequency during the day a more blood in the urine; whereas in prostatic hypertrophy, the day frequen is less than in stone, but the night frequency is greater, the pain is less a there is less blood in the urine. Moreover, residual urine points to prosta hypertrophy as well as does an enlargement of the prostate by rectal examin tion. A cystoscopic examination shows the presence of calculus when it present, as well as a bulging base of the prostate when the gland is hyp trophied. A bimanual recto-abdominal examination is always important, es cially in thin individuals; as not only can an intravesical growth often be ma out in this way, but stones in the bladder behind the prostate or elsewhere a tumors of the bladder can often be outlined by this means.

A rectal examination is important in cases of prostatic enlargement; bu is not as important as a bladder examination, as an extravesical growth fe very large to the touch, but does not give rise to much bladder disturban whereas an intravesical growth may appear but slightly enlarged by the rectu and yet may be of sufficient size in the bladder to give rise to complete rete tion. Only a small percentage of practitioners can interpret what they feel rectal examination, according to my experience with them in teaching pr tatic diseases. Many good general surgeons considering themselves expert prostatic surgery, cannot make a good prostatic diagnosis. They may be a to operate, but have not the diagnostic training.

Strictures.—Strictures are frequently mistaken for prostatic hypertrop I have a number of times had cases of supposed prostatic hypertrophy sent me when the cause of their urinary frequency, tenesmus and small amount residual urine was due to a stricture in the perineal portion of the anteri urethra.

On one occasion a man sixty-five years old was sent to me for a prostat tomy. He had all the symptoms of hypertrophy; but my routine examinati showed that he had an impassable stricture just in front of the bulb in t perineal portion, and rectal examination showed that he had absolutely

prostate. The gland had evidently been destroyed by a prostatic abscess in a case of acute parenchymatous prostatitis many years before and yet he was sent to me by a well-known New York surgeon at a time when but few surgeons were doing prostatic work. The impassable deep anterior stricture was operated by a perineal urethrotomy, with a complete recovery.

Parenchymatous Prostatitis.—The diagnosis between a prostatic hypertrophy and an acute parenchymatous prostatitis is easy, as the latter is an acute process, with febrile symptoms, usually associated with a gonococcal urethritis and occurring generally in young men. It comes on quickly and subsides quickly, and a few days' observation will usually be sufficient to tell us which of the two it is. Of course, men of the prostatic age are occasionally infected with the gonococcus and may develop a parenchymatous prostatitis; but such cases are rare and they are more liable to develop a posterior urethritis associated with a catarrhal prostatitis that is extremely difficult to cure. In performing a large number of prostatectomies, I have found but one in which a considerable amount of pus was present in the prostate.

Tumors.—Tumors of the prostate are the most difficult to differentiate from prostatic hypertrophy, but tumors of the bladder are easily differentiated.

*Tumors of the bladder* cause as great, if not greater, frequency of urination by day as does prostatic hypertrophy, but not as great night frequency. Residual urine is not so great in amount in tumor of the bladder. Hematuria is more marked and constitutes the principal symptom in bladder tumors; whereas cystoscopy shows its presence, besides which it shows the presence or absence of intravesical hypertrophy of the prostatic base.

*Tumors of the prostate* are more difficult to differentiate from prostatic hypertrophy than any other condition. The principal tumors are carcinoma and sarcoma. Of these, sarcoma is very rare, whereas carcinoma is comparatively common. Carcinomata of the prostate are much harder than hypertrophy, in fact, they often feel as hard and smooth as the head of a bone, such as the femur. More often, however, they are irregular in outline. There are the same urinary symptoms as in hypertrophy, with perhaps more dysuria. Pain in the back is more common and distressing. Hematuria is common in cancers that have begun to break down and have involved the mucosa of the urethra and bladder.

**The Nonoperative Treatment of Prostatic Hypertrophy Including Catheter Life.**—The nonoperative treatment of prostatic hypertrophy is directed to the relief of the symptoms, and to the prevention of complications. The measures adopted for this purpose may be divided into (1) palliative treatment, and (2) catheter life.

(1) Palliative Measures.—Much can be done for a patient suffering from prostatic hypertrophy by palliative measures, and this method of treatment depends to a great degree upon the amount of obstruction and the complications

the later stage. The drugs principally used to quiet this irritability are codein, morphin, belladonna and hyoscyamus, the first two being reserved for those cases in which the pain is very severe. Morphin should never be prescribed internally when it is possible to avoid it. A preparation of value to administer in such cases is:

| | | | Grams. |
|---|---|---|---|
| ℞ | Tr. belladon. | ♏ vijss | .5 |
| | Potass. acetat. | grs. xv | 1 |
| | Aq. menth. pip. | q. s. ad ℥j | 4 |

M. S.: A teaspoonful three times daily between meals in a glass of water.

Or,

| | | | Grams. |
|---|---|---|---|
| ℞ | Tr. hyoscyami | ♏ xx | 1.3 |
| | Potass. acetat. | grs. xv | 1 |
| | Aq. menth. pip. | q. s. ad ℥j | 4 |

is also recommended in the same way.

Another prescription for the same purpose is the following:

| | | | Grams. |
|---|---|---|---|
| ℞ | Codein | gr. ss | .03 |
| | Tr. belladon. | ♏ x | .65 |
| | Potass. acetat. | grs. xv | 1 |
| | Aq. menth. pip. | q. s. ad ℥j | 4 |

S.: A teaspoonful three times daily in a glass of water between meals.

Sometimes patients do not find the desired relief at night, in which case a suppository may help diminish the discomfort better than internal remedies. The following suppository is recommended:

| | | | Gram. |
|---|---|---|---|
| ℞ | Ext. belladon. | āā ¼ grain | 0.016 |
| | Morphin sulphate | | |

Sig.: Once on retiring and repeat if necessary.

If the urine is alkaline, urinary antiseptics should take the place of the alkaline salts, as benzoic acid grs. xv, salol grs. v, or urotropin grs. x. The various bladder specifics, such as sammetto, corn silk and buchu, sometimes give relief, but they are uncertain and at present not much used. The care of the bowels should not be neglected, and some laxative should be given which will produce a movement every morning. Cascara sagrada extract 2 to 6 grains at night, is a good remedy. The dose varies with the susceptibility of the patient to this class of drugs. Saline aperient waters, such as Apenta ℥iv, Carabaña water ℥ij, given in the morning, are of especial value.

*Local Treatment.*—Washing out the bladder is also of assistance. It has often puzzled me to understand how plain water, at a temperature of only a little above blood heat, can possibly relieve frequency and tenesmus in cases of marked bladder irritability, due either to congestion or cystitis; but such is frequently the case. Astringent and antiseptic solutions are of more benefit, however, than simple hot water. Those most serviceable in prostatic cases are boric acid, nitrate of silver and permanganate of potash. Other solutions, such as protargol, argyrol and picric acid, are more rarely used.

The manner of employing hot rectal douches of salt solution and hot sitz baths has been considered, as well as prostatic massage, under The Treatment of Prostatitis. Aspiration has been fully considered in the chapter on Retention of Urine in the first volume. Diet, exercise, clothing and personal hygiene have also been considered in the first volume and again mentioned under Prostatitis.

Moderate exercise is recommended and must be such as to increase the general circulation, without favoring local congestion. Brisk walking, followed by a rub down and change of clothing is one of the best means of exercise. Woolen underclothing should be worn, and the damp clothes should not be allowed to dry upon one after perspiration has taken place. It is important to see that the feet are kept warm and dry. Avoid bicycle and horseback riding, as well as the so-called athletic sports. Golf is probably the best of all exercises. Fresh air is of great benefit, care being taken regarding exposure to wet and cold, as this will induce acute congestion of the kidneys, in case they are involved, followed by uremia. These hygienic measures are important, as they tend to prevent congestion, which gives rise to acute attacks of retention and may serve to improve the tone and general vigor of the system, thus fortifying it against infection. Too much cannot be said of the importance of preventing prostatics from becoming chilled. If possible, they should go to an equable climate for the winter, such as Nassau in the Bahamas or Southern California. It is noticeable that prostatics usually become worse in the fall of the year, especially in the month of November. It is therefore advisable for them to leave the cold North in October, especially if they live by the seashore.

(2) Catheter Life.—By "catheter life" we mean the habitual use of the catheter to which prostatics with obstruction to urination are obliged to resort in order to rid themselves of a given amount of urine which otherwise they would be unable to void. This life is begun in cases of prostatic hypertrophy with complete or partial chronic retention, or during attacks of acute retention; in other words, either when only a part of the urine can be voided and enough is left behind as residual urine to interfere with the health of the patient, or when no urine can be passed spontaneously.

The popular interpretation of catheter life is that it is a measure to be adopted when nothing can be passed. Naturally, complete retention is the form which most demands the catheter; for, if nothing was done to relieve

a case of this kind, the bladder would dilate to such a degree that either it would rupture, or the ureters and the pelves of the kidneys would dilate until sufficient pressure was brought to bear upon the kidney proper to interfere with its function and to cause death from uremia. Nature, however, usually protects the patient from such a fate by relaxing the bladder sphincters and allowing an overflow of the contents to take place.

In unrelieved cases of partial retention, the residual urine present gives rise to enough bladder irritation to cause considerable suffering, and an obstructive cystitis generally develops. This may be followed later by ureteritis, pyelitis and pyelo-nephritis, and may end in death from uremia or from septicemia, as in cases of complete retention, though more slowly.

*Catheterization.*—If no relief is obtained by the general measures above described, and if the amount of residual urine seems to be increasing, the use of the catheter to empty the bladder should be commenced. If there are four ounces of residual urine present and the symptoms are distressing, the patient should be catheterized once a day, morning or evening. If the amount of residual urine is greater—say eight ounces—it should be drawn off twice a day, night and morning, great care being taken to keep the catheter clean and to employ the technique described farther on. In such cases, no cystitis being present, there will be no necessity of washing out the bladder, except with the expectation of relieving any bladder irritability that may be present, or preventing possible infection from the instrumentation. If the amount of residual urine is found to be twelve ounces, the patient should catheterize himself three times daily. If it is sixteen ounces, catheterism four times a day will be required. Twelve ounces is the normal average amount voided by a man in health at the usual intervals of urination—i. e., in the morning, at night and perhaps two or three times during the day—and if the residual urine amounts to this quantity, the bladder is practically in a condition to demand catheter life. As a pint of residual urine is usually sufficient to cause an imperative desire to urinate, in order to pass away the additional amount which is constantly being secreted by the kidneys, he would be obliged to pass urine very frequently, or else he would have an overflow retention.

The following tables may then be given for catheterization:

| Residual urine | | |
|---|---|---|
| 4 ounces, once a day, | | 3 ounces, once a day, |
| 8 ounces, twice a day, | or | 6 ounces, twice a day, |
| 12 ounces, three times a day, | | 9 ounces, three times a day, |
| 16 ounces, four times a day, | | 12 ounces, four times a day, |
| | | 15 ounces or more, five times a day, |

according to the relief it gives the patient.

Such is really incomplete retention, but retention of sufficient importance to call for the use of the catheter, as otherwise the back pressure produces

serious complications. The amount of residual urine often becomes less under catheterization and, as the amount decreases, the frequency of the catheterization should decrease in proportion. If a patient beginning treatment has a pint of residual urine, he should use the catheter four or five times a day; but, if under treatment it should decrease to six or eight ounces, then twice a day would be frequent enough for the catheterization.

So far, I have spoken of incomplete retention. If in any such case a pronounced excess of urine should accumulate in the bladder, either an overflow incontinence would result or else an acute attack of complete retention. Such a complete retention, occurring in a patient who has a greater or less amount of residual urine, may depend upon the patient's postponing the emptying of his bladder until the contents have overcome the resistance of the bladder wall; in other words, until the urine has dilated the bladder wall to such an extent that its contractile power is interfered with. This usually happens when a man is intoxicated, or while driving, or sailing, or in some other situation in which he cannot urinate when the desire comes.

As a rule, however, these attacks are due to prostatic congestion or edema, brought about by exposure to wet and cold, thus chilling the extremities and causing a determination of the blood to the prostate. In these cases, the patient suffers considerably. He has pain and a cramplike feeling in the suprapubic region, a desire to urinate, but an inability to do so, and there is generally a little dribbling.

When a patient is seen in this condition, the greatest care must be taken in handling the case, as it means suddenly breaking a patient into catheter life and it is a crisis in his existence. The dribbling and incontinence, if present may be sufficient to prevent death from hydronephrosis and consequent uremia but, the bladder wall being considerably dilated, the blood vessels are being more and more pressed upon and the muscular tissues are being distended and weakened. The patient in this condition always seeks relief.

The physician, called to see the patient, very often draws off all the urine and a congestion of the bladder takes place and the urine accumulates again but this time the congested bladder is more irritable and cannot contain as much urine as before. The suffering is intensified and the patient again seeks relief. This continues; the bladder congestion increases, pain, tenesmus, dribbling of urine mixed with blood and pus (if infection has taken place) being almost constant. This is the picture that presents itself when the patient has escaped death, but, unfortunately, he has suffered greatly, and in all probability will suffer still more from the cystitis which is almost sure to follow.

It is therefore wiser for the physician, called to attend a patient with his first attack of retention, to observe the following suggestions:

He should insert a sterilized catheter lubricated with sterile glycerin, or some bland lubricant, through the urethra into the bladder and draw off

quantity of urine not exceeding sixteen ounces. He should not draw off the entire contents, as in these cases several quarts may have accumulated, and in this event there might result a fatal syncope or an acute congestion of the entire urinary tract, due to the rush of blood to the urinary organs after the pressure has been removed. Such an acute congestion in a kidney affected with Bright's disease or with some surgical renal disease might interfere with the functional activity of the organ and inhibit the requisite excretion of urea, thus producing uremia. As hematuria and death from renal congestion have occurred after the removal of twenty ounces of urine, it is safe to put the limit as a hard and fast rule at sixteen ounces. An opiate should then be given to relieve the pain, and a hot sitz bath should be administered, after which hot fomentations should be applied over the suprapubic and the perineal regions. If in two hours the patient is able to pass a fair amount of urine spontaneously, he should be instructed to void it at intervals of an hour or two. If he cannot urinate at the end of four hours, the catheter should be again inserted and twelve ounces should be withdrawn, and the same amount again in three hours. After this, eight or ten ounces can be withdrawn every two hours until the bladder is empty or until the patient has regained the power of spontaneous urination. It often requires several days, during which a catheter is passed every two or three hours and ten ounces of urine withdrawn each time before the bladder is finally emptied. In one case it was not until the fifth day that I finally succeeded. I am convinced that the rules just outlined are most important to follow.

In case the physician, on visiting the patient in this condition, cannot pass either a straight or elbowed soft-rubber or woven catheter of small caliber, he should give the patient morphin hypodermically and order a hot sitz bath. Very often the patient can pass some urine in the bath. If not, after an hour's rest, the physician should again try to pass the catheter. If unsuccessful after two or three baths and hypodermics, he should aspirate the bladder suprapubically with an aspirator and withdraw not over a pint of fluid. Then hot applications should be made above the pubes, and usually the patient will be able to urinate spontaneously after an hour or so, or else the catheter can be passed. If not, the patient should again be punctured at the end of from four to six hours, and this procedure should be repeated at these intervals until the prostatic congestion has gone down sufficiently to allow of spontaneous urination or to permit the introduction of a catheter. Generally a few punctures will suffice, although in some cases one hundred and more punctures have been made. Personally, I have had to resort to aspiration but twice in private and hospital cases in over twenty years of practice in urinary troubles.

When the patient has begun to urinate spontaneously, the physician can determine the amount of residual urine present, and can use the catheter at the intervals indicated by the tables already given.

In case the patient has no spontaneous urination after the catheter has been used for several days, and if he has pain or tenesmus when from twelve to fourteen ounces have accumulated, then constant catheter life will probably have to be begun, and the frequency of using the catheter will depend upon the individual case.

Catheter life is usually introduced by an explosion which takes place when the patient is leading a methodical life, without thought of having to resort to artificial means of urination, the explosion being an acute attack of retention, such as has been described above. The explanation of this is as follows: A certain amount of residual urine had been present perhaps during a considerable period of time without the patient's knowledge, and then an acute congestion of the prostate occurred, followed by an acute retention. There are, however, many cases in which the patient has never had retention, but consults his physician for a feeling of local weight in the bladder region, and it is found that he has from six to twelve ounces of residuum. There are other cases in which the patient knows he has prostatic hypertrophy and has been using the catheter habitually, but suddenly the retention becomes acute, and the treatment described above has to be resorted to. When the daily use of the catheter has to be resorted to, the patient has to be shown how to pass the instrument himself, and the surgeon should not only furnish him with directions for doing this, but should teach him personally the details of the technique of catheterism.

*Equipment for Catheter Life.*—The catheters used should be of soft rubber, straight or with elbowed end, No. 12 to 16 French, and they should be bought by the dozen in assorted sizes, so that the patient may never find himself without the proper catheter, and may always have another at hand if one fails to enter. It must be remembered also, that catheters lose their tone and become roughened or else too soft by sterilization. If the patients cannot use the soft-rubber catheters, they may be given the woven variety of the same shape and size. As catheter life is a very important matter for the prostatic patient, he should be properly equipped for the same, just as he is equipped with proper clothing for the different seasons. He should, therefore, purchase a small sterilizer, in which the catheters can be boiled over a small gas stove; or, if he is obliged to use the woven catheters, a small formalin sterilizer as well.

*The Lesson.*—The physician should prop the patient up on a bed or sofa, should take a sterilized catheter, dip it into a bottle of sterilized glycerin and, holding the catheter by the proximal end, he should open the lips of the meatus until the end is engaged, then the catheter should be allowed to drop, partly of its own weight, partly impelled by a gentle impulse, down into the urethra as far as it will go. If the catheter stops, the surgeon must bring his hand down farther on the instrument and gently guide it past the impediment in the prostatic urethra, or through the compressor urethræ muscle if this is in a spasmodic condition. The catheter must now be given into the hands of the

patient, and the surgeon should watch him as he passes the instrument, instructing him as he proceeds (Fig. 623). It may take several days of such instruction before the patient can pass the catheter into his bladder, but after he has mastered this procedure he should be allowed to pass it on himself as often as necessary. The physician should, however, see the patient as often as is needed to treat the cystitis, should it be present, and to continue the observation of the case.

Fig. 623.—How the Patient Should Use the Catheter. Position of patient, and coudé and bi-coudé catheters.

Very often a patient broken into catheter life will be able to catheterize himself much more easily than it can be done by the physician. On several occasions I have failed to pass a catheter on patients who could perform this procedure very easily upon themselves. On the other hand, on many occasions the surgeon can pass the catheter on patients who cannot do so, owing to nervousness and lack of confidence. The only catheters that I recommend are the soft-rubber and the woven varieties, either straight or elbowed, and no other varieties should be used by patients who catheterize themselves.

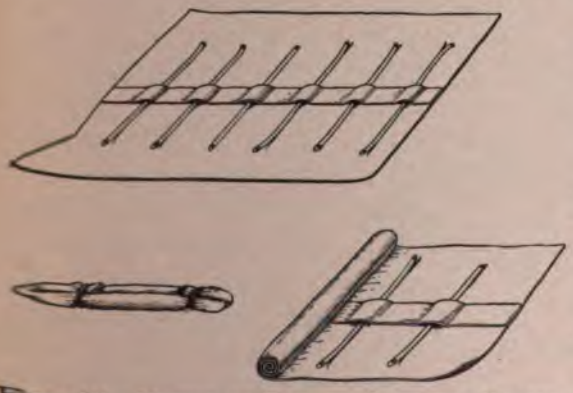


Fig. 624.—Method of Carrying Catheters Wrapped in Towels.

When the patient goes to business in the morning, he should take his catheters, in the towel in which they have been sterilized, and place them in his pocket (Fig. 624). He should also take along a bottle of the sterile lubricant. When

the time comes to pass the catheter, he should unwrap the catheters, take one out, dip the end of the instrument into the lubricant and pass it according to the rules just given. He should wrap the soiled catheter in another towel and place it in another pocket. This procedure should be repeated during the day as often as is necessary, the frequency depending upon the urgency of the desire to urinate. On arriving home at night, the patient should wash the catheters used, flush them out, wrap them in a towel, sterilize them again, together with the towel, as directed, and take them down to business in the same way on the following day. (See Sterilization of Instruments, Vol. I.)

*Complications of Catheter Life.*—Attacks of acute retention due to congestion or edema of the prostate have already been spoken of. They are such frequent complications of prostatic hypertrophy as to constitute a part of its symptomatology. Next in frequency is *cystitis.* The treatment of cystitis in these cases should consist in washing out the bladder, in addition to the measures indicated under the heading of Local Treatment under Palliative Treatment. If the bladder is washed out every other day, the best treatment is by irrigation with weak solutions of silver nitrate, the usual strength being 1 : 2,000, given through the catheter. If the bladder is washed out once a day, a still milder solution (1 : 4,000) of silver nitrate is indicated. It is often advisable to wash out one day with a saturated solution of boric acid, and the next day with a silver-nitrate solution. If the patient is directed to wash his bladder out twice daily he should use either a saturated solution of boric acid, or one injection with boric acid and the other with silver nitrate.

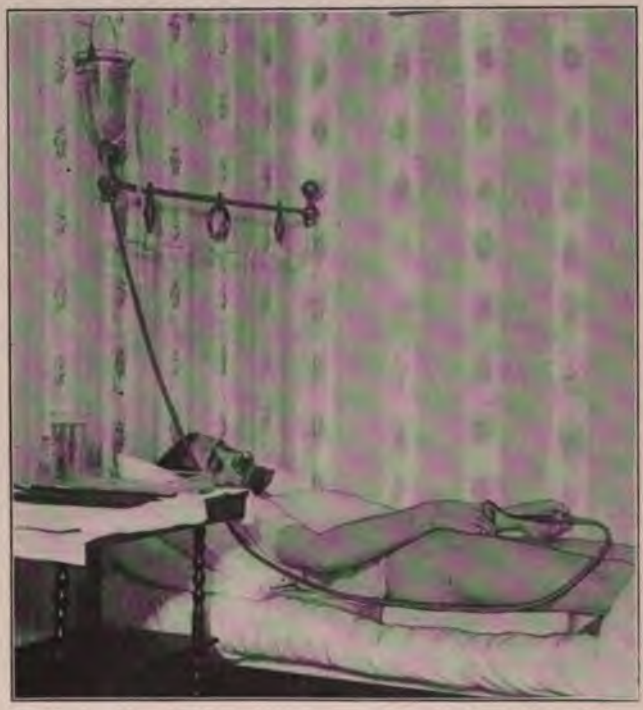


Fig. 625.—How a Prostatic Should Wash Out His Bladder.

The technique of these irrigations is very simple, and they can easily be performed by the patient himself. (Fig. 625.)

The patient places himself on a douche pan in a reclining position. A fou

tain syringe is hung up above his bed by a pulley attached to the wall, and at the end of the tube a cut-off with its nozzle is attached. Before getting up in the morning, the patient lowers the reservoir (bag or jar), fills it with a hot solution, passes the catheter, draws off the urine, and leaves the instrument in place. The nozzle at the end of the tubing is next introduced into the outer end of the catheter, and the patient allows the fluid to run into the bladder until it feels distended. He then withdraws the nozzle and allows the solution introduced to run out into some vessel between his legs. This procedure is then repeated until the bladder has been thoroughly cleansed. At night, before the patient goes to bed, the same treatment is repeated. The fountain syringe (one of glass is to be preferred) can remain on the wall, and the end of the tube with the coupling nozzle can be dropped into a bottle containing a 1 : 2,000 bichlorid solution, standing on the floor by the bed. After a little practice, the patient himself can attend to these irrigations as well as anyone. The hot water is brought him in the morning. He makes a boric-acid solution by adding a tablespoonful of the powder to a pint of water; or, if he is to use a silver-nitrate solution, by adding four drops of a grain-to-a-drop solution to a quart of water to make a 1 : 4,000 solution, or eight drops for a 1 : 2,000 solution, if desired. These solutions should be as hot as can well be borne. The catheters that have been sterilized the night before and wrapped in a towel can be kept by his bedside.

*Urethritis* of a mild, nonspecific nature sometimes occurs during catheter life, in which case it is desirable to change the lubricant, using one made from Irish moss, mild gomenol or albolene. It is necessary to inspect the catheters carefully to see that none is used that is sufficiently worn to irritate the urethra and, if so, to procure a fresh supply; also, if the inflammation still continues, to give an injection of a mild astringent solution after each catheterization.

*Epididymitis* is one of the most annoying and painful complications and is due to a traumatic posterior urethritis following difficulty in passing the catheter. If the vesical sphincter resists the passing of the catheter, it is better for the patient to take a suppository composed of morphin and extract of belladonna, together with a hot sitz bath and then, after a short rest, to try again with a smaller catheter. After epididymitis has set in, a fifty-per-cent ichthyol ointment can be applied to the testes, or a hot poultice, besides which urotropin, salol, or a benzoate can be given internally as a urinary antiseptic. The attacks are usually of short duration.

*Urethral fever* is due to some slight traumatism of the urethra causing an erosion. After a catheter has been passed, some pus in the urethra may be absorbed by the raw surface, or purulent urine passing over the lesion may be absorbed. In either case, a chill, fever and sweating may follow, leading the patient to think that he has an attack of malaria. In such attacks, the temperature may go to 101° or 105° F., but rapidly goes to normal again.

Sometimes a patient may have simply a slight chill or cold feeling after the night catheterization, with a stiff feeling and slight headache or pain in the back. The temperature may be ½ to ¾ degree above normal. In such cases, the patient probably has a slow chronic form of urethral fever and will probably become slowly emaciated and finally die from asthenia or some kidney involvement. Many of the patients have pyelitis and chronic nephritis as well.

When the temperature goes to 103° or 105° F. and then drops to 100° or 101° F., but does not go to normal, together with a rapid pulse and sweating, one must think of renal complication and examine the kidneys to see if one is enlarged and tender, in which case an abscess is probably present, especially if a pyelo-nephritis was known to exist before the sudden rise of temperature. Such a condition is very dangerous, as the patient is liable to die of sepsis or uremia.

The treatment of urethral fever is to give the patient a urinary antiseptic—salol, urotropin or a benzoate, alternating, while he is living a catheter life. Some of these patients have taken urotropin grs. x, three times a day for years. Ten grains of quinin and a hot whisky or lemonade should be given as soon as the attack takes place, and later three grains of quinin and half an ounce of whisky three times a day. (See Urethral Fever, Vol. I.)

If an *abscess of the kidney* develops, a nephrotomy should be at once performed, as the sepsis resulting from absorption in suppurative diseases of the kidney is very dangerous and often fatal. (See chapter on Suppurative Diseases of the Kidney.)

*Uremia in chronic nephritics* is a dangerous condition. It is usually due to an acute exacerbation of the chronic process. It frequently occurs during catheter life and causes the attending physician much alarm. For the treatment of this condition, see chapter on Chronic Nephritis and Uremia.

*Illustrative Cases.*—One of the most remarkable cases of catheter life that I have had and which I consider of sufficient interest to mention as an illustration, was a man sixty-eight years of age who had passed no urine for five days, although there was a slight leaking. His feet, legs and thighs were edematous and his bladder filled his abdomen to such a degree as to resemble ascites. He had a dry tongue, his mind was slightly wandering, but he had no fever. I drew off 22 ounces of urine, the last of which was slightly pink, tinged with blood. On the following day I began to catheterize him every two hours, and to draw off 15 ounces each time and in two days 366 ounces, or over eleven quarts, of urine was withdrawn. After this, a catheter was tied in and plugged; every two hours the plug was withdrawn and 12 ounces of urine was allowed to escape. It was between four and five days before the patient's bladder was emptied, during which time he passed about 5 gallons of urine. Some of this was, of course, secreted during the four or five days that he was under treatment. After this, the patient was catheterized for a month, when he began to pass ½ ounce every two hours. Later, he was able to pass 12 ounces in five

or six hours. The frequency with which he was catheterized after the plug catheter was withdrawn, was at first every two hours, then every four hours, then six, seven and eight hours, at the end of which time the catheterization was made according to the desire. It seems incredible that a patient with so much urine could ever reach the point when he needed only to be catheterized two or three times in twenty-four hours.

There is certainly a plea for the nonoperative treatment when we consider a patient whose history I am about to recount. Nine years ago, while crossing the ocean, when he was fifty-eight years of age, he was taken with his first attack of retention. For two days he could pass no urine, excepting at night, when he passed a very small quantity. He was suffering great pain from distention when he landed. For two weeks after this he had to be catheterized and could pass no urine spontaneously. Massage and electricity were then given and the patient began to urinate. The table represents the amount passed spontaneously and by catheter for the remainder of the time he was under treatment:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| First | day, | spontaneously, | 8 oz. | By | catheter, | 104 | oz. |
| Second | " | " | 12 " | " | " | 100 | " |
| Third | " | " | 16 " | " | " | 90 | " |
| Fourth | " | " | 20 " | " | " | 90 | " |
| Fifth | " | " | 25 " | " | " | 80 | " |
| Sixth | " | " | 30 " | " | " | 75 | " |
| Seventh | " | " | 40 " | " | " | 70 | " |
| Eighth | " | " | 48 " | " | " | 60 | " |
| Ninth | " | " | 54 " | " | " | 60 | " |
| Tenth | " | " | 60 " | " | " | 40 | " |
| Eleventh | " | " | 60 " | " | " | 20 | " |
| Twelfth | " | " | 60 " | " | " | 12 | " |
| Thirteenth | " | " | 64 " | " | " | 8 | " |
| Fourteenth | " | " | 69 " | " | " | 6 | " |
| Fifteenth | " | " | 83 " | " | " | 4 | " |

Catheterization was then discontinued and he went on to his home in a distant city. I did not see him again for five years. He was then sixty-three years of age and had but one ounce of residual urine. He has had several attacks of retention since then, but he was always provided with a catheter and immediately relieved himself, and it has not lasted more than a day or two. He is still going about comfortably and has retained his prostate for nine years. He has arrived at a point, however, when the removal of the gland is imperative, as his prostate is much larger and he has eight ounces of residual urine. He says that his sexual vigor is still unimpaired, and that he is able to have intercourse twice in the afternoon without difficulty.

# CHAPTER LI

## PROSTATIC ATROPHY, WITH SPECIAL REFERENCE TO INFLAMMATORY ATROPHY

*(Prostatic Deformities through Loss of Tissue)*

**Forms.**—There are numerous recognized forms of atrophy of the prostate, namely: (1) Congenital, (2) senile, (3) atrophy due to exhaustive diseases, (4) atrophy due to pressure and (5) inflammatory atrophy.

CONGENITAL ATROPHY represents an arrest of the prostatic development in the fetal stage. It is observed especially in combination with other congenital developmental anomalies in the urogenital apparatus, but it is most commonly associated with those of the testes.

SENILE ATROPHY is the most common variety, and, according to Thompson, is found in 5.5 per cent of all old men; although Socin fixes the frequency at 2.1 per cent. According to Englisch, the retrogressive changes of senile atrophy may start in the prostatic tissue as early as the fortieth year without a definite cause. The characteristic symptom in all reported cases was that either nothing or but a slight remnant of the gland could be felt through the rectum. I do not believe that atrophy of the prostate in old men is as common as Thompson's statistics represent it to be, and I consider such a condition at the present day to be extremely rare and probably the result of destructive inflammatory diseases due to gonorrhea or tuberculosis in early manhood.

ATROPHY OF THE PROSTATE DUE TO EXHAUSTING DISEASES is, according to Thompson, found principally in general tuberculosis, especially when the lungs are involved. It is of but little importance, whereas atrophy due to destructive changes in tuberculosis of the prostate is very important and will be considered under the inflammatory type.

PRESSURE ATROPHY is a form that occurs as a result of long-continued and especially of steadily increasing mechanical compression of the gland in a similar manner to that observed in other organs and tissues of the body. Prostatic cysts or echinococcus cysts of the pelvis, generally originating in connective tissue between the rectum and the bladder, sometimes cause this pressure. In a case of echinococcus cyst pressing upon the gland in an old man, the prostate was atrophied, although he was sent to the hospital as a case of prostatic hypertrophy.

True prostatic calculi imbedded in the gland are the principal causes of prostatic atrophy. They may exist as one very large stone or many small ones. The glandular tissue surrounding these calculi is sometimes thinned to such a degree that the prostate becomes only a thin-walled sac. Pressure atrophy of the prostate has also been shown in cases of stones located entirely in the prostatic urethra. In one of my cases, in a young man, in which a calculus was partly in the urethra and partly in the rectum, the prostate was atrophied. This form of atrophy may also be the result of a long-continued, very tight, urethral stricture, due to the pressure of the urine in the urethra, between the bladder and the stricture; as a sequel, there follows a gradual dilatation of the excretory ducts of the gland, with atrophy of the surrounding prostatic substance. I have seen two cases of this variety due to traumatic stricture of the perineal urethra. In one case, the prostatic urethra was dilated to such a degree and the pressure of the fluid was so tense, that I mistook the case for one of prostatic hypertrophy with retention and spasmodic stricture. Under anesthesia, I discovered my mistake and operated for the traumatic stricture which was tortuous and impassable, requiring a suprapubic cystotomy for the passage of a guide. After performing the perineal section I palpated the prostate with one finger in the prostatic urethra and the other in the rectum and found the gland to be very much attenuated. There was also no protrusion of the prostate in the bladder. Pressure atrophy of the prostate may originate as the result of instrumental pressure. Bazy found at autopsy partial atrophy of the gland in two prostatics who had worn a permanent retained catheter for months at a time.

Inflammatory Form of Atrophy.—This is not considered a true atrophy by all authors; but I am considering it as such and am thus in accord with Thompson, Socin and Burckhart, and others who regarded a decrease in the size of the organ, after an inflammatory process, as atrophy. The inflammations and suppurations which give rise to a reduction in size of the prostate are gonococcal prostatitis in the great majority of cases; next in frequency, tuberculous prostatitis; besides which there are a small number referable to other causes, such as posttraumatic inflammation, suppuration of a metastatic character, as in pyemia, typhoid fever, measles, influenza, pneumonia, smallpox, glanders.

**Pathology.**—According to Thompson, glands having a total weight (in adults) of less than 12.5 grams should, without exception, be considered atrophic. In glands between 12.5 and 15.36 grams in weight, the decision must be reserved until after a microscopic examination. The loss in weight is sometimes very considerable. The atrophic gland is as a rule more resistant and coarser than the normal organ.

In the *senile form* of atrophy, the interior of the prostate sometimes contains numerous cavities, separated by dense fibrous strands, and filled with fluid; or there may be small globular cysts, the result of absorption of glandular

elements and stagnation of the secretion in the gland tubules. Calculi may form in these cysts, the tissue atrophy being further favored by the pressure of the growing concretions.

In *pressure atrophy* due to urethral stricture, the excretory ducts of the gland are dilated at the expense of the adjacent prostatic tissue. This results in pocket-shaped depressions in the region of the urethral orifice, some of which may become confluent by absorption of the partitions. The mucosa of the prostatic portion presents an undermined appearance. In other cases of pressure atrophy, the excretory ducts are dilated deeply into the prostate, which appears as a sort of multilocular framework, communicating by sievelike orifices with the urethra and often containing multiple calculi.

**Symptoms.**—The symptoms of inflammatory atrophy of the prostate are those of a chronic prostatitis: a chronic gleety discharge, shreds in the urine, a slight urinary inconvenience, and symptoms of nervousness and neurasthenia.

Rectal examination shows depressions and irregularities in the gland, diminishing its size. The tissue is slightly harder than normal. In some cases there is no prostatic tissue or border felt, whereas at other times but a small amount is destroyed. The ejaculatory ducts can sometimes be felt through the prostatic capsule and remnants of prostatic tissue can be felt behind them.

I will first consider cases in which the atrophy and deformities were due to abscesses.

FIG. 626.—ATROPHY OF PROSTATE, SHOWING A FRAGMENTARY ORGAN. Note that the vesicles are elongated and dilated in places.

FRAGMENTARY PROSTATE.—The first case that attracted my attention was that of an actor who complained of a gleety discharge and a feeling of discom-

fort in the perineum, following a chronic urethritis. Both lobes of the prostate in this case were destroyed, with the exception of a few small fragments closely adherent to the ejaculatory duct, which latter could be distinctly felt through the external capsule. (Fig. 626.)

Saddle Prostate.—Another case coming shortly after this had practically the same history. Examination showed a saddle-shaped prostate nearly flat,

Fig. 627.—Saddle Prostate.

although depressed a little more in the center. This gland had been infected during a gonorrheal urethritis, resulting in a parenchymatous prostatitis of both lobes, breaking down into an abscess which, after discharge, had left only a small amount of tissue fairly well distributed after the healing process (Fig. 627).

Absence of Prostate in Old Man.—The next case was that of a tailor, aged sixty-eight, suffering from difficult and frequent urination. Examination showed the prostate to be completely destroyed. The cause of his urinary troubles was an impassable stricture which I operated upon, after which I palpated the prostate with one finger in the prostatic urethra and the other in the rectum. Neither prostatic tissue nor the ejaculatory ducts could be felt. This may have been one of the cases of senile atrophy of the gland described by Thompson and Socin, or a case of pressure atrophy due to stricture (Fig. 628).

Prostate Destroyed by Abscess in Young Man.—The next case showed the destructive changes of the prostate by a parenchymatous abscess in a most striking way. The case has already been mentioned under parenchymatous prostatitis. The patient had been coming to the clinic for some time, suffering

from an anterior-posterior urethritis of a mild grade. He discontinued his visits for a few days and then returned, bringing a specimen that he had passed that morning on arising. The specimen was red and yellow in color, the lower

Fig. 628.—Prostate Completely Destroyed.

part being yellow and the upper part red. Urinary examination showed the urine to contain blood, a large quantity of pus and prostatic tissue. An examination of the prostate showed it to have been entirely destroyed. (See Fig. 574.)

Atrophy and Follicular Prostatitis.—In the case of follicular prostatitis, we first feel small nodules in the gland by rectum, and then we notice that they become smaller and disappear through undergoing resolution, or else they soften, break down into abscesses and discharge into the urethra, leaving depressions in the back of the prostate that can be felt through the rectum. How many of these depressions can be felt in other parts of the prostate, it is difficult to say, but probably most of them will ultimately be felt posteriorly, as most of the ducts open into this part of the canal. The deformities and depressions on the sides and the front that we cannot feel do not concern us; but those that we do feel are of endless shapes, when we consider the small area comprising the back of the prostate through which they must be delineated by the examining finger.

Usually, the depressions left are round and in one or the other lobe, or else a part or the whole of a quadrant has been destroyed by the coalescence of a number of follicles. In cases in which any part of the periphery of the back of the gland is depressed, the abscess has probably originated on that side of the

gland; whereas, when it originates in the center, the whole circumference of the depression can be outlined. These deformities are of every conceivable shape. I have seen them as a broad depression traveling vertically down the center of the prostate from base to apex; as a similar depression extending transversely across the middle of the gland; and both transverse and vertical, forming a cross. In other cases, there are losses of tissue in two places on one side, with healthy tissue between them, or in opposite lobes with healthy tissue between them. Again, both lobes are interspersed with atrophied and healthy tissue as a result of recurrent attacks of follicular prostatitis that have suppurated.

Condition of the Urethra in Follicular Prostatitis.—The results of follicular abscesses breaking into the prostatic portion of the urethral canal are more interesting than the posterior feel of the organ. It is very difficult to see the depression and small cavities opening into the prostatic urethra by the urethroscope, as the walls cling to the instrument and urine often leaks into the tube; yet instruments of small caliber introduced into the canal show the presence of these openings by catching in them.

Cavity in Prostatic Urethra Corresponding to Depression Felt by Rectum.—My attention has been repeatedly called to this. On the first occasion, I was operating on a stricture of a patient in whose prostate there was a marked depression on the posterior part of the gland as felt per rectum, evidently the result of a prostatic abscess. No instrument could be passed into the bladder and both the filiform and the Gouley tunneled guide caught in the prostatic urethra. Having cut down to the metal guide in the perineum and well exposed the deep urethra, I drew out the tunneled sound until I could catch the filiform, which I held in place, and then passed a probe along the upper posterior urethral wall into the bladder. I then inserted my finger between the filiform and the probe and located the sinus, and by the forefinger of the other hand in the rectum determined that the filiform had gone through the sinus in the posterior urethra into the cavity represented by the depression in the back of the prostate, felt by the rectum. I have seen cavities in the posterior urethra large enough to admit the end of my little finger, but they are usually smaller, or at least the openings into them are smaller.

Up to this time, I had never had the opportunity of performing an autopsy on a patient dying with a prostatic abscess just after it had burst into the urethra. At last, however, the opportunity offered itself and I regret that I did not make a more careful record of the case.

Condition of Posterior Urethra Four Days after a Follicular Abscess had Broken into it of Sufficient Size to Cause Retention of Urine.—The history of the case is as follows:

A Frenchman, thirty-three years of age, entered the City Hospital, complaining of pain in the back, incontinence and dribbling of urine of an indefinite

duration. He stated that he had never had a venereal disease. Examination showed tenderness over both kidneys. There was dullness over the pubes and, although he had just passed three ounces of urine, it was evident that he had not emptied his bladder. The prostate was much enlarged on the right side. He was catheterized and 28 ounces of urine withdrawn. It was noticed that pus then escaped alongside the catheter, also after its withdrawal, and that massage of the prostate expressed more, while the prostatic swelling decreased in size. He died four days later of uremia. At the autopsy the entire urinary tract was removed. There was a pyelo-nephritis of the left kidney and a chronic diffuse nephritis of the right. Both kidneys were acutely congested. The bladder was acutely inflamed and the ureters dilated. The prostatic urethra was congested and showed some petechiæ; but, strange enough, although the abscess had burst into the urethra and discharged apparently half an ounce of pus four days

FIG. 629.—ATROPHY OF BOTH LOBES OF PROSTATE IN BOY CASTRATED FOR DISEASE OF TESTIS. Only the ejaculatory ducts could be felt.

before this, no sinus leading to the abscess cavity was seen. On pressing t prostate gland, some pus was detected escaping from a point on the poster surface of the prostatic urethra, which proved to be a narrow entrance to t pus cavity. The probe was introduced for about half an inch, and with its e bent it could be twisted about in the collapsed cavity. The patient died indire of a prostatic abscess, but directly of an acute congestion of the kidn caused by withdrawing 28 ounces of urine during an attack of retention w the patient was suffering from diseased kidneys. The entire lobe had b destroyed as the result of a prostatic abscess. In such a case, there would h

been a state of atrophy of one lobe of the prostate had the patient lived. There would also have been a chronic discharge for some time from the abscess cavity through its communication with the posterior urethra. In other words, the case was one of acute parenchymatous prostatitis that had broken down into an abscess which had discharged into the urethra, and the result if the patient had lived would have been one of atrophy of the prostate on that side.

Tuberculosis of the prostate is the cause of loss of tissue in the prostate, next in frequency after gonorrhea. The distribution of tubercular nodules and areas of suppuration in prostatic tuberculosis closely resembles that of follicular prostatitis, but the process is usually slower. The result is that the feel of a tuberculous and a follicular prostatitis is very similar, except that in tuberculosis the nodules are harder and more irregular, and the walls of the depression are better defined.

Atrophy of Both Lobes of Prostate Following Castration for Tuberculous Testes.—Another case was one of double castration, the second castration following some years after the first for tuberculosis. In this case the prostate was completely atrophied and the ejaculatory ducts could be felt running down to a thickened nodule, evidently the remains of the caput gallinaginis (Fig. 629).

**Treatment.**—The treatment resembles that of chronic prostatitis. It consists in softening the tissues, breaking up adhesions that are holding the gland ducts and interfering with the glandular function, stimulating the activity of any glandular tissue that has been liberated. This is accomplished by means of hot rectal douches of salt solution at night before retiring, massage of the prostate, dilating the prostatic urethra with the Kollmann dilator and irrigating this portion of the canal by means of the prostatic douche. The rest of the treatment is symptomatic. It is wonderful how much relief can be obtained by this means and how much incapacitated prostatic tissue can sometimes be liberated and made to functionate.

# CHAPTER LII

## MALIGNANT GROWTHS OF THE PROSTATE

**Etiology.**—The malignant growths of the prostate are carcinoma and sa coma, of which the former is the more common. The etiological factors are heredity; inflammatory changes; habitual local congestion; developmental di turbances and simple prostatic hypertrophy. Carcinomas and sarcomas of tl prostate are somewhat uncommon, but not so rare as was formerly believed t be the case. They may be either primary or secondary. The latter take thei origin generally through extension of a growth from a neighboring organ c tissue by continuity, or by metastases from a neoplasm in a remote part of tl body.

**Pathological Anatomy**—Carcinoma.—Epitheliomatous growths of tl prostate are divided into two groups: Intracapsular, those which are bounde by the prostatic capsule, at least apparently so; and extracapsular, those whi have already become diffused in the pelvic cavity (diffuse prostato-pelvic ca cinosis).

*Intracapsular Epithelioma.*—The gland is increased in size as a whole, especially in one of the lobes; or its size may remain normal, while the c sistency is increased, and the surface may be smooth or irregular. The ves trigone is raised more or less, and the curve of the urethra may be altere the dominance of one of the lobes (Figs. 630 and 631). Intracapsular gro usually invade the tissue beyond the capsule before death.

*Extracapsular epithelioma* is better known and is characterized by a nu of deformities of the gland itself, with an extension of the growth in v directions. Some prostates retain in a great measure their shape and si spite of the invasion of the neighboring tissue, while others are very sm sembling atrophy.

Tumors are occasionally quite superficial, growing from the base prostate (Fig. 632). Some tumors may reach the size of a fist, or may true pelvis, and they may also communicate with the iliac glands and retroperitoneal lymph glands along the spinal column. The surface of tl may be smooth, but it is usually irregular and nodular. Its consistenc hard, and its color is pinkish gray.

**Symptoms.**—Carcinoma.—The symptoms of prostatic cancer resemble those of hypertrophy and are unfortunately not characteristic, and but slightly marked.

Fig. 630.—Intracapsular Epithelioma of the Prostate. A sagittal section through a bladder and prostate. There is a slight intravesical projection. There is no sign of encapsulation, but numerous yellow-white areas have appeared which are most numerous toward the bottom of the gland. The fibrous tissue is slightly translucent. The spongy nature of the normal gland is entirely lost. A microscopical section shows spheroidal-celled carcinoma. The patient was sixty-five years of age, and had presented symptoms of prostatic trouble for about five years. There was a secondary growth in the right pleura. (Wallace.)

Fig. 631.—Intracapsular Epithelioma of the Prostate. A coronal section of a bladder and prostate taken through the urethra. The cut surface shows the lobulation usually seen in the simple adenomatous form of enlargement. There is a well-marked external "capsule." On the left of the picture this structure is laminated, but on the right it is homogeneous in appearance. The lower part of the central mass is proved by microscopical examination to be carcinomatous. (Wallace.)

Years may intervene between the appearance of the first symptom and the time when the patient presents himself for examination. In certain cases, the tumor is found only at the autopsy.

Disturbances of micturition are the first signs in the great majority of cases. Night frequency is par-

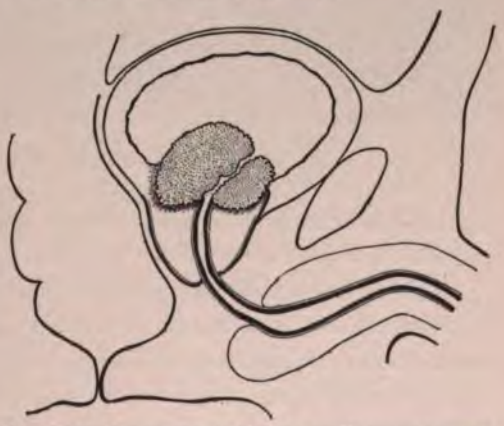


Fig. 632.—Carcinoma of Prostate, Protruding into Bladder. (Author's case.)

icularly common, from five to six times per night. The exertion necessary o empty the bladder becomes constantly more marked, and is greater than in prostatic hypertrophy. In proportion to the increasing difficulty, the act of voiding urine is prolonged, the urinary stream becomes smaller and more feeble, and dribbling of urine sometimes follows. Finally, an attack of retention may take place.

Incontinence may occur, as the result of the changes in the vesical neck, due to the neoplasm. Hematuria is important, but is neither constant nor pathognomonic. Its presence assists the diagnosis, but it is usually a late manifestation, and indicates the invasion of the vesical trigone or the urethra by the neoplasm. The presence of tumor fragments, cancer cells, with prostatic tissue and blood in the urethral discharge or the urine, is pathognomonic of malignant neoplasm.

Pain on micturition may appear at the very beginning and may be very severe, especially in the vesico-prostatic region. Besides pain in the prostate itself, there is also pain in the sacro-lumbar region, which the patient speaks of as lumbago. This is an important symptom, and is due to the involvement of the retroperitoneal glands.

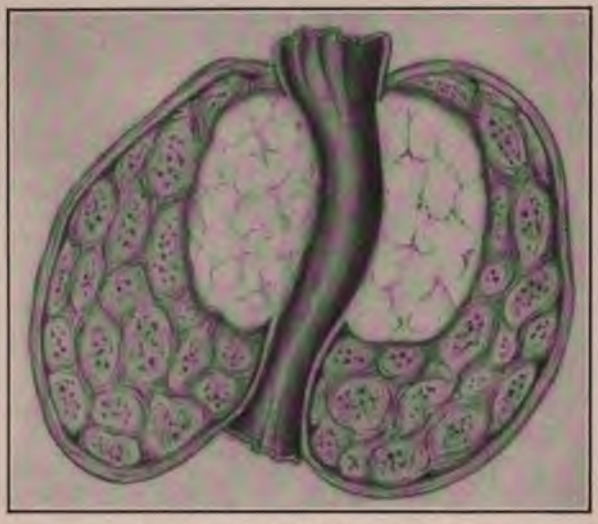


Fig. 633.—Sarcoma of Prostate. (Author's case, City Hospital.)

Vague pains in the legs, like sciatica, have been frequently complained of by my patients.

Rectal symptoms may predominate over the vesical, especially in secondary cases extending from the rectum. They are painful defecation, tenesmus, rarely a bloody discharge, diarrhea, through rectal irritation.

The *course* is variable, and the latent stage may last for several years. In very malignant cases, th duration, according to Wolff is from a few months to three years. I have never had a patient live over tw years after the removal of a carcinomatous prostate.

Sarcoma.—These growths are probably developed from embryonic tiss remnants rather than from the prostate gland itself. Some have been descrit as containing striped muscle fibers (malignant rhabdomyoma) (Fig. 633).

The histological structure of these growths is composed mostly of smal large round cells in large quantities. Less frequent varieties are spindle sarcomas, myxosarcomas, lympho-sarcomas and angiosarcomas.

Symptoms.—In adults, the course and symptoms of sarcoma do not essentially differ from carcinoma, but there is less tendency toward infiltration of adjacent tissues, and the growth remains for a long time in a state fit for enucleation. The tumor often develops backward and downward toward the rectum and perineum. The processes may extend into the rectum and protrude from the anus. The urinary symptoms are not more marked than in epithelioma, but the pain is much greater. I have never had a case in childhood, although such cases have been reported.

The clinical examination, in all cases of suspected malignant tumors of the prostate, is the same as that in hypertrophy, plus a search for enlarged lymphatics and metastases. Rectal examination shows the prostate to be very hard and generally nodular, but sometimes as hard and smooth as the head of the femur. The base of the bladder may also be indurated. This hardness, together with pain, is most important from the diagnostic point of view.

**Diagnosis.**—A hard, fixed, nodular condition of the organ associated with pain points to malignancy, while a large, soft and elastic prostate is benign. Cystoscopy, showing nodules on the trigone and about the internal meatus, or ragged ulcers there, points to carcinoma. Even on vesical examination after enucleation, one cannot say positively that the tumor is malignant in all cases of intracapsular growths.

**Treatment.**—There are three methods of operation: Prostatectomy, when the growth is limited to the prostatic capsule; removal of the growth with a section of the bladder (Young's operation) and the formation of a permanent fistula with a valve. When the growth is intracapsular, it should be enucleated. It is much more difficult to enucleate a malignant growth than a benign one, yet so far I have always been able to enucleate them when they were purely intracapsular, with good results as far as relieving the symptoms of urinary obstruction was concerned. I could not cure existing metastases and lymphatic involvements by this means; nor were the pains in the back benefited, in fact, they grew constantly worse.

In cases in which the growth has become extracapsular, an enucleation is not only useless, but may do harm through tearing into the rectum, through wounding the veins of the prostatic plexus and thus causing septic phlebitis by the infection with septic urine, or through tearing into the cellular tissue, thus giving an opportunity for infection by septic urine and consequently septicemia.

Some years ago, I read a paper at the Academy of Medicine in which I cited two cases, on the importance of making a bladder fistula in inoperable malignant growths of the prostate, and advocated making a permanent bladder fistula by the method used by Käder in the stomach, which provided a valve for the prevention of leakage when the fistula was not in use. On this occasion and on several others in which I have spoken of the treatment of inoperable

malignant growths by this method, some one has always spoken of malignant growths that they have removed by prostatectomy, completely overlooking the fact that the subject under discussion was inoperable growths that could not be removed without great danger to the patient. I refer to this subject again,[1] as I consider it sufficiently important.

The Käder operation for making a permanent stomach fistula with a valve to prevent leakage from within, consists in making a vertical incision over the stomach through the anterior abdominal wall and then through the wall of the stomach. A tube is then inserted into the stomach, and several layers of Lembert sutures are passed through the stomach so as to invaginate the portion of the stomach wall about the tube and thus form a valve. This operation was adopted by Gibson for a permanent bladder fistula and was advocated by me in cases of extracapsular or inoperable prostates.

*Illustrative Cases.*—Two cases of inoperable prostate were sent to me during the same week, and an opinion asked for. They were both fifty-eight years of age and both were suffering from malignant growths that had already become extracapsular.

Case 1 complained of indigestion, pain in back, hips, thighs and rectum; frequency of urination, six or seven times a day and five or six times at night. Examination: The patient looked cachectic and weak. The prostate by rectum was hard and nodular, especially on the right side, and extended up along the vesicle. He had 16 ounces of residual urine, following an attack of retention, which was reduced to 7 ounces by treatment.

Case 2 was the same age, had the same symptoms, but urinated not quite so frequently. He was a much better preserved man and did not appear weak or cachectic. His prostate was hard and nodular and involved both lobes to about the same degree.

I advised the same permanent fistula and valve operation in both cases. The physician who sent Case 1 agreed to the operation recommended. I performed the permanent fistula and valve operation. The patient recovered and after leaving the hospital went to his home near New York. His physician's last report was that the valves were working well, that he could void 7 to 8 ounces of urine at a time through the urethra, and that he had a residuum of 12 ounces, which was withdrawn through the valve by catheter night and morning. The patient did very well afterwards; finally died of pneumonia.

The physician who sent Case 2 did not agree with me and thought that his patient should have a more radical operation and sent him to a general surgeon for operation. The general surgeon performed a prostatectomy and the patient died on the same day.

The reports of these two cases show us how important it is, in doing pros-

[1] "Transactions of the French Urological Association," vol. x, 1906, p. 419.

tatic surgery, to have sufficient experience to judge the variety of prostate requiring one operation and the variety requiring another.

In operating on one malignant growth of the prostate, suppuration was present, and quite a considerable amount of pus was found between the external and internal capsules. This patient had complained of nothing but frequency and pain in the prostate for two years. His prostate was very hard but not much enlarged. In another case of malignant prostatic neoplasm, a milk leg was present on the side corresponding to the growth in the prostate, due to an extension through the lymphatics and a consequent pressure on the iliac vessels.

To show how slightly the general condition of a patient is sometimes affected, I will speak of another case, a patient fifty-six years of age, who complained principally of pain in his back and difficulty in passing his urine. For a number of months he had been able to squeeze out with great difficulty only a small amount of urine at a time, in a small dribbling stream; and yet he played eleven sets of tennis in a day without much fatigue, a few days before he was operated upon. At the operation, the internal and external capsules were found joined together as firmly as if united by plaster, and while enucleating the gland I was constantly tearing through a gritty substance in the line of cleavage. This patient healed in two weeks and left the hospital a few days later. He had no further difficulty in urinating after his prostatectomy and no symptoms except a general emaciation and weakness, together with severe pain in the back from the involvement of the postperitoneal glands.

# CHAPTER LIII

## OPERATIONS ON THE PROSTATE

### OPERATIVE TREATMENT FOR PROSTATIC HYPERTROPHY

In looking over the history of the past century, we find constant references to the operative treatment of prostatic hypertrophy. These increased in number and value as the years rolled by, owing to the never-tiring work for the advancement of prostatic surgery in the hands of Harrison, Guyon, Mercier, Gouley, Maisonneuve, Bottini, White and Freudenberg, until the interest in prostatic surgery centered in the removal of the gland by prostatectomy.

The operations performed by different surgeons were those of drainage; the methods causing absorption of the gland or reducing the obstruction by dilatation; methods of diminishing the size of the gland by the use of the galvanic

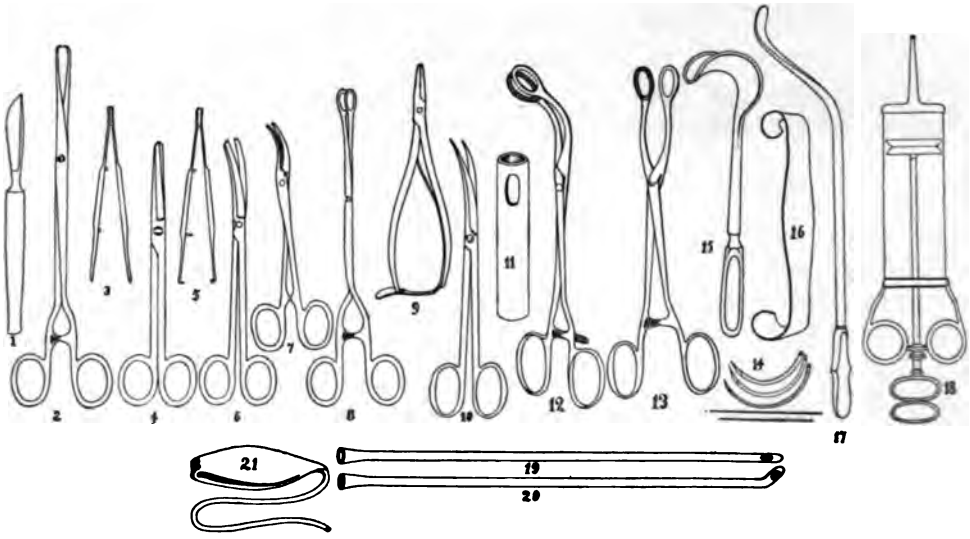


Fig. 634.—Instruments Used in Operations upon the Prostate.

*1*, scalpel.
*2*, bullet forceps.
*3*, thumb forceps.
*4*, straight blunt-pointed scissors.
*5*, mouse-tooth forceps.
*6*, curved blunt-pointed scissors.
*7*, artery clamp.
*8*, sponge-holding forceps.
*9*, needle holders.
*10*, curved sharp-pointed scissors.
*11*, drainage tube.
*12*, Guiteras curved prostatic forceps.
*13*, Guiteras straight prostatic forceps.
*14*, Hagedorn and straight needles.
*15*, retractor.
*16*, retractor.
*17*, prostatic depressor.
*18*, large hand syringe.
*19*, straight catheter.
*20*, coudé catheter.
*21*, rectal bag.

current, by injections of various fluids into it, by ligating the vessels supplying it, by castration, by ligating the vas deferens; operations tending to destroy the obstructing parts, the various prostatotomies, by cutting and galvano-cautery operations; and later methods of removing the entire obstructing body, that is, the entire gland by enucleation, prostatectomy. The palliative measures have already been explained in the chapter on the Nonoperative Treatment of Prostatic Hypertrophy, except the operations for drainage which will not be considered, as they are no longer employed. Of the other methods above enumerated, all have now been discarded, except the Bottini prostatotomy and prostatectomy, the former of which is now rarely used.

**Bottini Operation.**—The Bottini Incisor.—Bottini devised his galvano-caustic prostatome in 1875 and discarded it two years later for a second instrument, called a "prostatic incisor." With this last instrument, he could reduce the mechanical obstruction at the neck of the bladder by slowly burning grooves through it. The Bottini incisor some twenty years later was modernized by Freudenberg and is still employed with good success in operating upon certain patients who are not in sufficiently good condition to stand a prostatectomy.

Fig. 635.—Bottini Incisor, Modified by Freudenberg.

The incisor is an instrument 16½ inches long (Fig. 635), which resembles closely a Thompson lithotrite in its shape and formation, the great difference being that the male blade is thinner than that of the lithotrite and is connected with a galvano-caustic battery which heats it to white heat so that it acts as a cautery knife. It is worked by a wheel attached to an Archimedian screw in the handle, as is a lithotrite, while the outside shaft or female blade is kept cool by a stream of water constantly passing through it. The difference in the working of the two instruments is, that the lithotrite is first opened and, after grasping the stone, is closed, the male blade being pushed toward the female, thus crushing the stone; whereas in using the incisor, its beak is caught behind the prostate while closed, the Archimedian screw (wheel) is then turned, which opens the instrument by drawing the male blade backward away from the female, thus burning its way through the gland.

My object in these remarks is to compare the instrument under consideration with one that has been for a long time familiar to the eye of the practitioner, in order that he may have a better idea of its general appearance. The remainder of the female part is hollow, so that cold water may run through it and keep the shaft of the instrument cool while the cauterization is taking place. There are two nozzles extending down from the handle on either side,

to which two pieces of rubber tubing are attached; one leading up to a reservoir on the wall, the other down to a receptacle on the floor. The water cooling the instrument thus flows from the reservoir down the first piece of tubing through the instrument and then down through the other piece into the pail or receptacle below. The hollow part of the instrument, through which the water runs, is called the cooling apparatus.

The power can be derived from a portable storage battery; but if the operation is done in an institution where there are electric lights, it is much better to make use of the street current. If the current is alternating, it is simply necessary to make use of a transformer to reduce the current of the street to four volts; but if the current is direct, a rotary motor must be used in addition to the transformer, to reduce the current to the strength desired.

The transformer and the portable amperemeter are very light and can be carried about with ease. The dial of the amperemeter shows the number of amperes being used, the same as the dial on the face of the battery. The amperemeter on the battery should be placed at the right of the operator, where the dial can be seen and the screw for turning on the current can be easily reached.

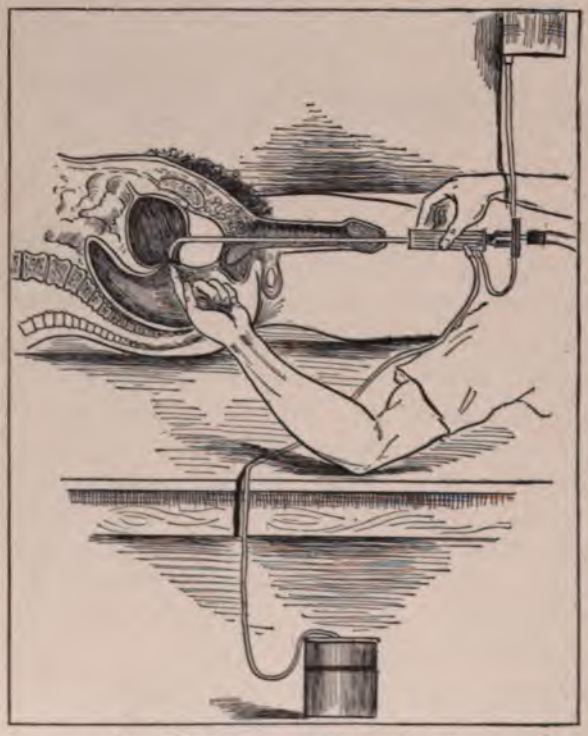


Fig. 636 A.—Bottini Prostatotomy. The incisor in position for operation.

Technique of Operation.—The reservoir containing the cold water should be hung on the wall on the side corresponding to the patient's left. The tubing coming from this should be attached to the water pipe on one side of the handle of the instrument, and another piece of tubing should be attached to the other pipe and from there extend to some vessel on the floor. The bladder should then be washed out and anesthetized with cocain or eucain, and then six ounces of boric-acid solution introduced.

The incisor is now passed into the bladder. Sometimes it will not enter on account of a spasmodic contraction of the sphincters, in which case nitrous-oxid gas should be administered.

After the instrument is in the bladder, the forefinger of the left hand should be inserted into the rectum and its tip hooked over the base of the prostate in the median line. The handle of the instrument in the other hand should then be turned until the beak is looking downward, when it should be drawn forward until it catches behind the prostate. The tip of the instrument can usually be felt by the forefinger in the rectum, although it may be higher up than the rectal base of the gland in cases of intravesical growths (Fig. 636 A).

At this stage, the finger of the left hand is withdrawn from the rectum and grasps the handle of the instrument with the knuckles up. The elbow of the left arm rests upon the table between the legs of the patient, and the fingers of the right hand grasp the wheel of the Archimedian screw at the end of the instrument, as in Fig. 636 B.

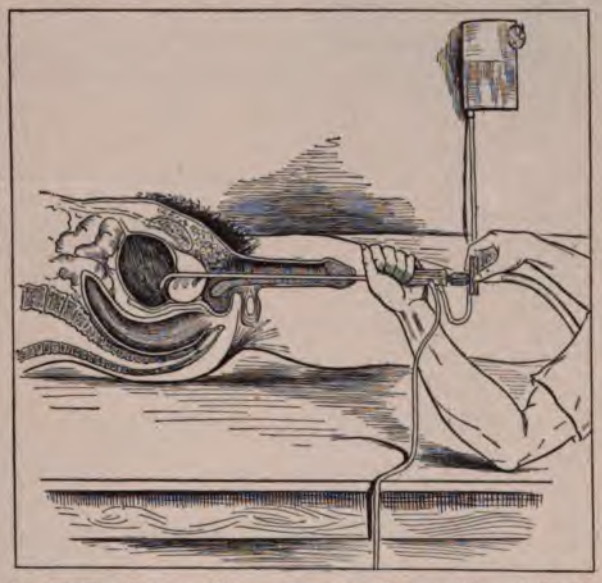


Fig. 636 B.—Bottini Prostatotomy. The position of the instrument and the operator's hands while the incision is being made.

The operator glances about him to see that the water is running through the cooling apparatus; that the pipes are in a corresponding position on either side, thus showing that the beak is exactly behind the middle of the prostate; that the connection is made; he then instructs the assistant to turn on the power. When this has been turned on until the swinging hand on the amperemeter indicates forty-five amperes, after waiting a few seconds, the operator begins to turn the wheel of the instrument slowly, holding it steadily and watching the number of centimeters appearing on the scale, which indicate the length of the incision that is being made. This incision is usually about 3 to 3.5 centimeters (an inch and a quarter) long. The blade is then slowly glided back again by turning the wheel in the opposite direction. The time required to make this incision is usually from one and a half to two minutes. The beak of the instrument is then turned at right angles and caught in behind the margin of the larger lateral lobe.

The second incision is made usually 2.5 to 3 centimeters, and the time spent in making it is a minute and a half. The third incision is either through the front of the prostate or the other lateral lobe. If through the other lateral

lobe, the incision would be the same as before; if through the front of the prostate, the length of the cut would be about 2 centimeters, and the time required about a minute and a quarter.

Immediately after the operation, the patient may be allowed to pass water, if he desires, and should then be put to bed. Patients are generally able to walk from the table to their beds, although it is safer to carry them.

After-treatment.—The internal treatment consists in urinary antiseptics, diluents and antispasmodics, if necessary. If retention of urine occurs, as it frequently does, a catheter is passed into the bladder and allowed to remain for from twenty to forty-eight hours. On withdrawing the catheter, if the patient is still unable to pass much urine, he should be catheterized regularly or the catheter should be retained for a week. If at any time complications occur, or if his postoperative progress is not satisfactory, an external perineal urethrotomy should be performed for drainage.

Comments.—In commenting on the Bottini operation, I should like to say that it is one that exposes a patient to but little danger; it relieves the symptoms and diminishes the amount of residual urine. Many patients who had complete chronic retention and had been leading a catheter life, in whose bladders 16 ounces of residual urine were usually found on catheterization, were able after the operation to pass all their urine except from 1½ to 4½ ounces. But little can be judged of results until after three weeks, as the sloughs are thrown off in from seven to twenty-one days. Besides this, the Bottini-Freudenberg operation did much to stimulate us all in our prostatic work and not only as far as prostatotomies are concerned, but in working out our technique in that much more important operation, prostatectomy.

The patients who should be operated on by means of the Bottini incision are those who have a fibro-muscular prostate or the type spoken of by some as the nonencapsulated, and not those having the adenomatous type. I have, however, operated on many large adenomatous prostates by the Bottini method and have been surprised to see the lasting results, as I believed that the soft adenomatous tissue would rapidly crowd about the urethra both outside and in the bladder, and again obstruct it. In the case of these large adenomatous prostates referred to, I advised a prostatectomy and only resorted to the Bottini operation because the patients would not consent to the former procedure. A Bottini operation does not interfere with a prostatectomy in intravesical adenomatous growths, as I have had the opportunity of judging at later operations. In most cases that progress badly after the operation, I felt called upon to do an external perineal urethrotomy for drainage. It also happened that the cases ending fatally were those who were not doing well after the operation and upon whom a sufficiently early external urethrotomy was not performed. This would indicate that it is safer to do a Bottini operation in connection with a perineal urethrotomy.

**Chetwood Operation.**—The Chetwood operation is to my mind a decided step in advance of the Bottini method. Chetwood's instrument is a modification of the Bottini incisor (Fig. 637), but it is shorter and less complicated. He first opens the perineal urethra by an external urethrotomy. He then

FIG. 637.—CHETWOOD'S INCISOR.

passes his finger into and through the prostatic urethra and palpates both the extra- and intravesical portions of the gland, also bimanually with the finger of one hand in the rectum and that of the other hand in the prostate. He thus has a better idea of the prostatic obstruction and proceeds to perform his operation through the perineal incision under the guidance of his explorations.

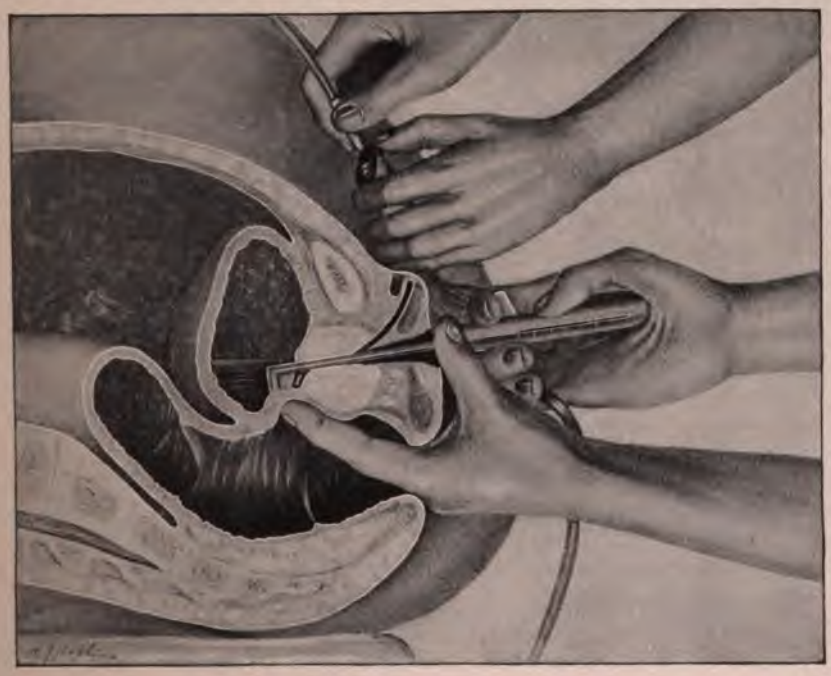


FIG. 638.—CHETWOOD'S OPERATION.

TECHNIQUE.—The patient is placed in the lithotomy position. An external perineal urethrotomy is performed. The Chetwood incisor is passed into the bladder through the perineal incision. The instrument is turned so that its beak points downward and it is then drawn down until the beak catches behind

the base of the prostate. The forefinger of the left hand inserted into the rectum feels the beak of the prostate over the prostatic base. The current is now turned on and the blade of the incisor is drawn through the prostatic impediment by making gentle traction on a sliding crosspiece on the handle. Chetwood sometimes makes another incision through the largest lobe. These incisions vary from ½ to ¾ of a centimeter in length.

**Prostatectomy.**—The removal of the prostate is to-day the only radical operation for the cure of prostatic hypertrophy. The history of prostatectomy is briefly as follows:

History.—Prostatectomy was first performed by Cavillard in 1639, then by Anvessot in 1827, by Guthrie in 1834, Ferguson in 1848, Billroth in 1869, Gouley in 1874, Von Dittel in 1885, Bellfield and McGill in 1886 and 1887, Zuckerkandl in 1889, Goodfellow and Wishard in 1890, Alexander and Nicoll in 1894 and Fuller in 1895.

From this time on, the operation, despite its crudities and dangers, engaged the attention of surgeons and began to start on its way toward the present perfect state, although for a number of years it was practiced only in malignant cases and as a rarity.

It soon became apparent, however, that prostatic hypertrophy presented a much wider field for removal of the gland than did malignant growths, and numerous surgeons, some of whose names I have just mentioned, began one after another to operate by the different anatomical routes which seemed to them to show the best approaches. The gland was removed as follows:

(1) Through the rectum.

(2) From below, infrapubic.
- (*a*) Through the perineum behind the urethra and prostate (extraurethral).
- (*b*) Through the perineal urethra (intraurethral).

(3) From above through the bladder, suprapubic.

The rectal route has been advocated by a number of surgeons and practiced by them from time to time, but it is not a good surgical procedure and will not be considered here.

The perineal route seems to have been the first taken by surgeons for the relief of prostatic hypertrophy, and Cavillard in 1639 performed a prostatectomy in this way. In the last century, it was advocated by Guthrie in 1834. Ferguson performed the operation in 1848. In 1867, Billroth took up the operation for cancer, as already mentioned. Von Dittel of Vienna next performed the operation in 1885; but it was not until 1889 that a well-defined operation with a careful surgical technique was made by Zuckerkandl of Vienna.

Infrapubic or Perineal Extraurethral Prostatectomy.—*Technique of Zuckerkandl's Operation.*—Zuckerkandl began with a semicircular perineal incision in front of the anus, with the convexity pointing toward the scrotum. He then made a dissection in front of the rectum and, having dissected through the anterior attachment of the sphincter ani down to the prostate, he bored into the external capsule with a screwlike instrument so as to pull it down into the operative field. The separate lobes of the prostate were then removed through the external capsule. In 1894, Nicoll took up Zuckerkandl's operation in England, modifying it slightly by making an inverted "T" incision instead of a semicircular one and by opening the bladder suprapubically in order to insert the fingers of his left hand and push the gland down into the perineal wound while enucleating the gland from below. The perineal extraurethral operation was then taken up in France by Albarran, Proust, Delbet and others, who introduced various steps for controlling the gland during the prostatectomy. The best method up to that time had been the Parker Syms inflated balloon, which I showed in Paris at the International Medical Congress in 1900. This could be passed into the bladder through an external urethrotomy opening in the perineal urethra and then dilated and its tube used as a tractor. Syms still uses this in his perineal prostatectomies. The benefit of traction by this means is that it does away with opening the bladder suprapubically, although it does necessitate making an opening into the urethra, which before this had not been considered necessary. It was, however, left for Young of Baltimore to give the finishing touches to extraurethral perineal prostatectomy and, although his operation is a modification and combination of Zuckerkandl, Nicoll, Syms and the French prostatectomists, it has brought out the best feature of each and is performed with a masterly technique. The description of Young's operation is as follows, as taken from Keen's "Surgery":

"*Technique of the Operation of Conservative Perineal Prostatectomy.*—Position of the Patient.—The exaggerated dorsal position of the patient is the most satisfactory, and the perineal board devised by Halsted is admirably suited for this purpose. The perineum should be so elevated that it is almost parallel with the floor, thus allowing excellent retraction of the rectum and splendid exposure of the posterior surface of the prostate. After placing the patient upon the table, before elevating the thighs, a No. 24 French sound should be inserted into the posterior urethra, to be used subsequently as a guide for urethrotomy. If the operator waits until the patient is placed in the urethrotomy position, he will frequently find it difficult to introduce the sound through the triangular ligament.

"Cutaneous Incision.—The inverted 'V' cutaneous incision unquestionably gives a much better exposure than a median incision. The apex should be just over the posterior part of the bulb, about two inches in front of the anus, and the lateral branches directed outward and backward parallel to the ischio-pubic

ramus, each about two inches in length, as shown in Fig. 639. The incisions are carried through the skin, fat and superficial fascia, and then by blunt dissection with the handle of the scalpel and the index finger of the left hand the space to each side of the central tendon is opened up. In this way it is very simple to open up by blunt dissection very quickly a space on each side reaching as far as the triangular ligament. In so doing the levator ani is pushed backward and outward on each side and the transversus perinei muscles are pushed forward.

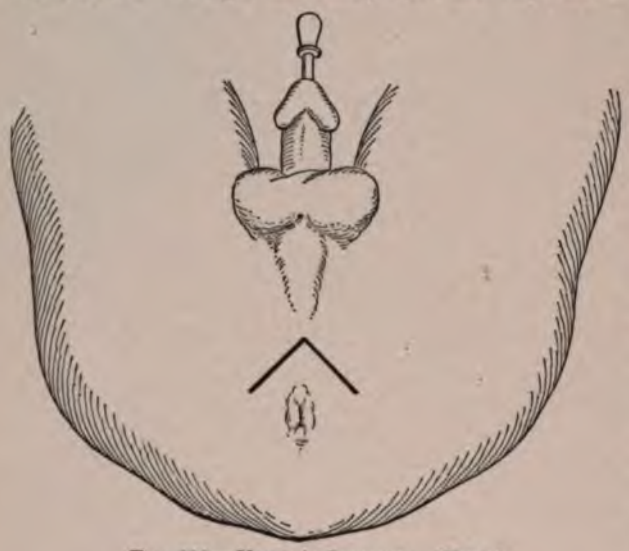


Fig. 639.—Young's Incision. (Keen.)

"Exposure of the Membranous Urethra.—The bifid retractor is inserted as shown in Fig. 640; traction upon this instrument gives an excellent exposure of the narrow band of central muscle and tendon and greatly facilitates the division close to the bulb without injuring this hemorrhagic structure. After the central tendon has been completely divided and the posterior surface of the bulb freed, it is well to insert a retractor, by which the bulb is drawn upward and a better view obtained of the recto-urethralis muscle, which lies between the two branches of the levator ani and covers the membranous urethra, toward which it draws the anterior wall of the rectum. In dividing the recto-urethralis muscle care should be

Fig. 640.—Young's Operation, Showing Bifid Retractors.

taken not to injure the rectum, which is often drawn forward so that it lies almost in front of the membranous urethra. It nearly always covers the apex of the prostate. As soon as the recto-urethralis has been thoroughly divided it is easy by blunt dissection to push the rectum backward and thus obtain a good view of the membranous urethra, the bulb being drawn forward along with the muscular structures of the triangular ligament. The membranous urethra is then opened upon the sound (Fig. 641) and the edges picked up with ordinary clamps, being sure to secure the mucous membrane. A sound is then inserted into the bladder through the urethral wound (an assistant having withdrawn the sound from the anterior urethra), to open up the way for the prostatic tractor, which is then inserted into the bladder through the perineal urethrotomy wound. Owing to the rectangular shape of this instrument (Fig. 642) it is sometimes difficult to insert. Sometimes it is well to begin its introduction with the beak turned backward, and then to rotate the instrument 180 degrees before carrying it into the bladder. After the instrument has penetrated into the prostatic urethra it is generally advisable to remove the anterior bulb retractor,

Fig. 641.—Young's Operation; Opening of Urethra on Sound.

Fig. 642.—Young's Retractor Closed.

and thus allow the shaft of the tractor to be carried farther forward. As a rule, little difficulty is experienced in inserting the tractor if one has been careful to secure the edges of the mucosa of the membranous urethra. After reaching the bladder the blades of the tractor are opened out by means of the external handles (Fig. 643), and after being fixed in this position by means of a set screw, traction is made upon the prostate, and the further separation of the rectum

from the posterior surface of the prostate made. After dividing the recto-urethralis muscle and exposing the apex of the prostate one generally finds it necessary to use the knife to divide a layer of fibrous tissue (the posterior layer

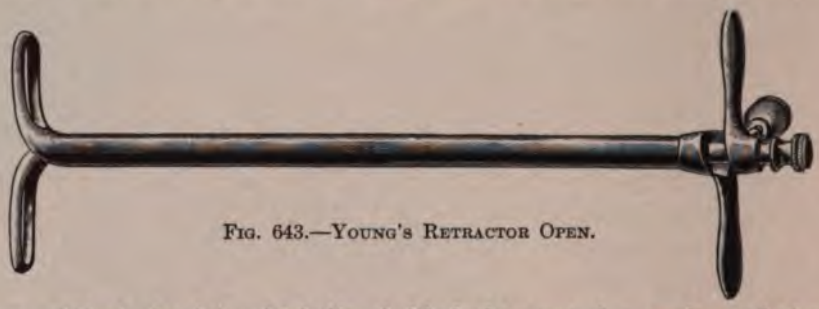


Fig. 643.—Young's Retractor Open.

of Denonvillier's fascia) which lies behind the posterior surface of the prostate. After this has been divided the rectum can be more easily pushed backward, and one enters, generally with ease, into the space between the two layers of Denonvillier's fascia, and the smooth glistening surface of the prostate is exposed. When this layer is properly exposed, no difficulty whatever is experienced in rapidly freeing the entire posterior surface of the prostate and seminal vesicles, a good view of which is obtained at once by the insertion of a broad angular retractor, such as is shown in Fig. 644.

Fig. 644.—Young's Posterior Retractor.

"Incision of Capsule.—Lateral retractors are so placed that with posterior retractor drawing the rectum backward and the prostatic tractor drawing the gland outward a splendid exposure of the posterior surface of the prostate is obtained. An incision is then made through the capsule on each side of the median line for almost the entire length of the posterior surface and about 1.5 centimeters deep. These incisions are about 1.8 centimeters distant behind and 1.5 centimeters distant in front, as shown in Fig. 645. The bridge of tissue which lies between them contains the ejaculatory ducts and the floor of the urethra. The advantage of these deep incisions is that it brings us to the side of the urethra, where separations from the internal surface of the prostatic lobes can be easily begun.

"Enucleation of the Lateral Lobes.—This is begun with a blunt dissector, the capsule being first elevated from the posterior and external surface of the lateral lobes on each side. In a similar way the urethra and external surfaces of the lateral lobes should be separated. At the apex of each lateral lobe firm adhesions to the capsule are present, and it is advisable to divide these with scissors. It is then best to insert the index finger and continue the enucleation

first along the anterior surface of the prostate until the bladder is reached, and then laterally and internally until finally the entire lateral lobes are enucleated. During this procedure the tractor is of great assistance, not only in drawing down the prostate, but the shaft shows the position of the urethra and the intravesical blade and the position of the vesical mucosa, so that the operator is able to avoid tearing into both these structures. Occasionally it is advisable to grasp the lobe during the process of enucleation with lobe forceps (Fig. 645) which are intrusted to an assistant who makes traction upon them. In enucleating the lateral lobes it is important to leave nothing behind, and particular care should be taken, especially anteriorly, as it is an easy matter to overlook a portion of the gland in this region.

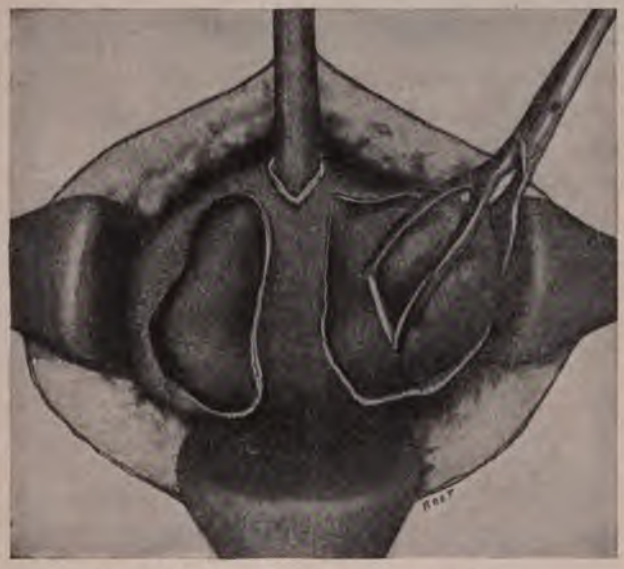


Fig. 645.—Young's Enucleation of Lobes.

"The Enucleation of the Middle Lobe.—After the lateral lobes have been shelled out attention should be directed to the median portion of the prostate. If a definite rounded lobe is present (and the previous cystoscopic examination, which should always be made, will tell what is to be expected), it is generally possible to engage it with one blade of the tractor in the bladder, and by rotation and traction to deliver it into one of the lateral cavities, sometimes with the assistance of an index finger, as shown in Fig. 646. In this position the lobe can generally be grappled with a lobe forceps and enucleated without injuring the ejaculatory ducts behind it or the vesical mucous membrane covering it. Occasionally small tears are made into the urethra, but these are of no consequence. Very little difficulty is thus experienced in shelling out median lobes of considerable size (in several cases they were three inches in diameter). In many instances, however, the median enlargement is in the shape of a transverse bar which cannot be enucleated effectively with the blade of the tractor in the bladder. In such cases it is often wise to pick up this portion of the prostate with a sharp hook through one of the lateral cavities, as shown in Fig. 647, and then to begin to separate first from the ejaculatory ducts which lie behind it and then from the urethra in front of it. After being partly freed it can be

grappled with small hemorrhoid clamps and removed with little difficulty, generally by blunt dissection, but sometimes with the aid of scissors. Removal of the median lobe leaves a cavity communicating with two lateral cavities in front of the ejaculatory ducts, and behind the urethra.

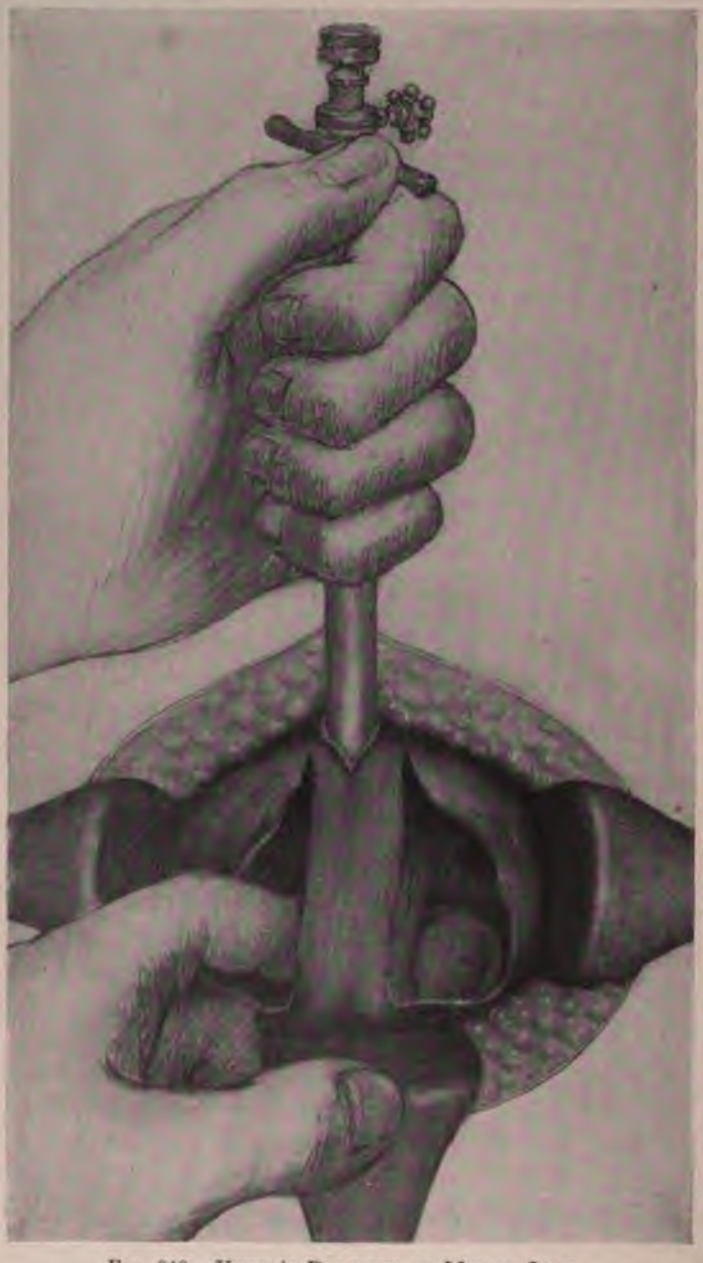


Fig. 646.—Young's Delivery of Middle Lobe.

"Insertion of the Finger into the Bladder.—It is next advisable to examine the condition of the vesical orifice and sphincter with the finger, as it is not infrequent to find a sclerotic band around the vesical orifice. As a rule, a linear tear has been made along one of the lateral walls of the urethra, and through this the finger can be introduced into the bladder. It is often found to be tightly gripped, sometimes by a firm fibrous band which requires considerable force before it will give way sufficiently to allow the finger to enter the bladder. In such cases it is well to thoroughly dilate the vesical orifice with the finger and with forceps. A careful examination should be made as to the conditions around the orifice, first to see whether

the median portion of the prostate has been completely removed, whether a bar or any valvelike structure remains to lead to subsequent obstruction to urination. The intravesical portions of the lateral lobes should then be examined, and if any portion remains it should be removed, using the finger as a tractor to draw forward and cause it to present the remaining portion. Care of this sort prevents leaving any portion of the gland which might in the future give trouble. It is also well to sweep the finger through the bladder cavity, searching for interesting conditions, calculi, diverticula, etc.

"Closure.—After the operator has made certain that the lateral and median lobes have been thoroughly removed, that the vesical orifice is well dilated and that no calculi remain, double drainage of the bladder through the prostatic urethra should be provided. For this purpose it is best to use two large catheters, the eyes of which have been enlarged and their ends sewed together after being obliquely divided, so that they form a common point and can thus be easily introduced. One of the catheters is at once connected up with a fountain syringe and the bladder thoroughly washed clean of blood. One or both of the catheters may become plugged with clots, but by "stripping" the catheter strong suction is obtained and the clots easily evacuated. The lateral cavities are then carefully packed with gauze, a single three-inch strip being used on each side and care being taken to pack only the interior of the prostatic capsule, the ends of the gauze being brought out along with the rubber tubes. The catheters and gauze wicks are then drawn forward by a retractor while an examination is made of the anterior wall of the rectum; the index finger of the right hand, which has been covered with a rubber glove, being inserted into the rectum and a digital examination of the rectal wall thus thoroughly made. If the operation has been carefully performed, no injury to the rectal wall will be discovered, but occasionally in the earlier operations I found that the rectal wall has been injured in separating it from the apex of the prostate. In such cases it is advisable at once to close the rent with two or three layers of sutures, the deep layer being of fine silk, the others of catgut, and to finally reinforce by sutures drawing together the levator ani muscles over the rectal wound. Unless a careful examination of the rectal wall is made, even a small tear is almost certain to result in a recto-urethral fistula.

Fig. 647.—Removal of Median Bar in Young's Operation.

"It is extremely important to draw the levator ani muscles together in front of the rectum in order to restore them to their normal position, and thus

give the rectum the support which they normally furnish. This can be done by means of a single suture of catgut. The support which this firm muscular buttress furnishes to the rectum is of great importance and should never be neglected. The skin is then closed with interrupted sutures of catgut, about four on each side, leaving the gauze and tube drainage to emerge from the apex of the wound, to which the tubes are fastened by suture."

Infrapubic or Perineal Intraurethral Prostatectomy.—It now remains for me to take up the other form of perineal infrapubic prostatectomy, the intraurethral form, which has been most extensively used in this country. This was first introduced by Wishard and Goodfellow in 1891 and was taken up as such and with modifications by Bryson, Alexander, Syms, Ferguson, Murphy, Watson, Cunningham, A. T. Cabot, myself and many others.

The Wishard-Goodfellow operation consisted in placing the patient in the lithotomy position, performing a perineal urethrotomy, inserting the forefinger of the right hand into the posterior urethra, making an opening through its wall, introducing the finger into the opening so as to strike the line of cleavage between the external capsule and the prostate. The lobes of the gland are then enucleated, the operator working either from below upward or from above downward, and making counterpressure above the pubis with the other hand. After enucleating the gland, bladder drainage was made through the perineal opening. The Watson and Cunningham prostatectomy operation closely resembles that of Goodfellow and Wishard's. The Alexander operation is also very similar to it, except that, like Nicoll, he opens the bladder suprapubically in order to make better counterpressure on the base of the gland during enucleation. In order to better control the prostate without opening the bladder in doing perineal prostatectomies, Bryson, Johnson and myself opened the abdominal wall above the pubes into Retzius's space and made counterpressure on the prostate.[1] I next tried the Syms balloon, which I liked very much, giving it up shortly to use a prostatic depressor which I will describe later. Various other ingenious instruments were used for depressing or pulling down the prostate, such as Murphy's hooks, Ferguson's tractor, and the tractors of Gouley, De Pezzer, Young and Lydston. I performed perineal prostatectomies for a while in cases in which the gland seemed low down and large by the rectal touch, whereas I employed suprapubic prostatectomy for marked intravesical growths. The following are the steps of the intraurethral perineal prostatectomy as performed by me at that time, and read before the American Urological Association meeting at New Orleans[2]

*Technique.*—The technique of the operation of perineal prostatectom advocated by me at that time was as follows: The patient should be prepar

[1] "Transactions of Third Pan-American Medical Congress," *Philadelphia Medical Jou* April 20, 1901.

[2] "Transactions of the New York State Medical Society, 1902, and New Orleans Medica ciety, 1903"; "Transactions of the XIV. International Medical Congress."

as usual, the perineum and suprapubic regions having been shaved, the rectum and bladder should be washed out clean before the operation. He should then be etherized and placed upon his back upon the operating table. A lithotomy guide is then passed through the urethra into the bladder and the patient placed in the lithotomy position. An external perineal urethrotomy is then performed, opening the membranous urethra, after which the forefinger is pushed through the perineal opening into the prostatic urethra with the object of examining the prostate and as much of the bladder as possible by palpation.

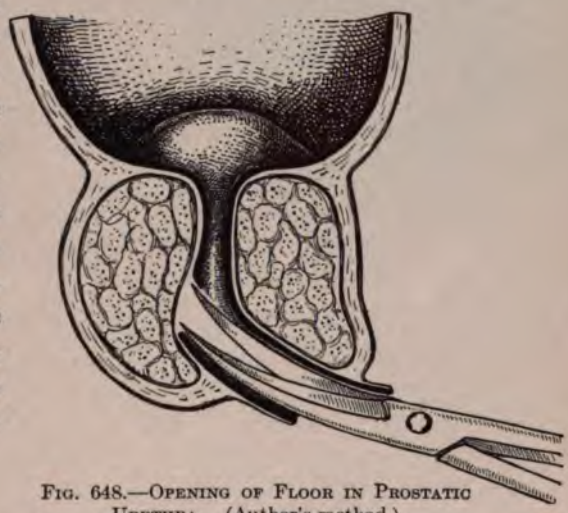


Fig. 648.—Opening of Floor in Prostatic Urethra. (Author's method.)

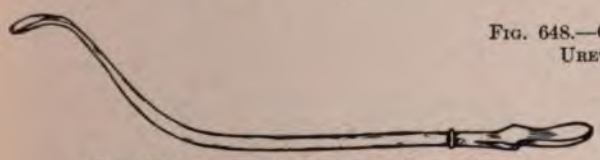


Fig. 649.—Author's Prostatic Depressor.

This opening is dilated with the fingers, or instruments, to a sufficient degree to introduce the blades of sharp-pointed curved scissors for cutting through the floor of the prostatic urethra. With the finger of the left hand in the rectum, pressing upon the gland, the operator introduces the points of the blades of a curved pair of scissors into the urethra until they have just passed the apex of the gland (Fig. 648). The sharp points of the scissors are pushed through the urethral wall over one lobe and then opened. This makes a tear down to the capsula propria of the prostate through which the enucleating finger can be introduced.

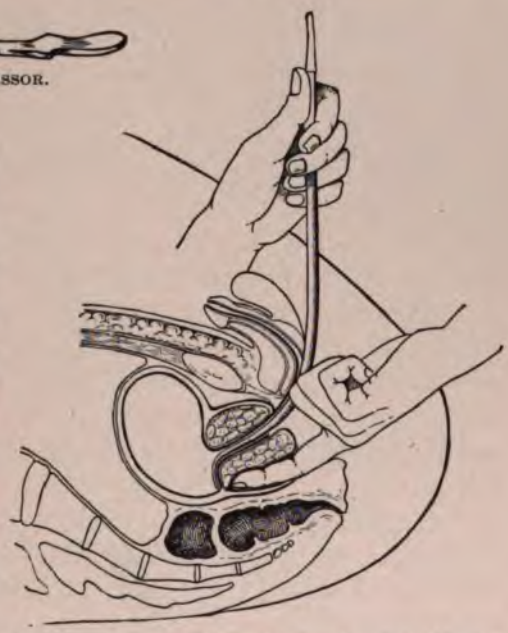


Fig. 650.—Finger Enucleating Prostate while its Base is Being Steadied by the Prostatic Depressor Pressed upon it from within the Bladder. (Author's method.)

The depressor (Fig. 649) is then introduced into the bladder through the urethra and its end pressed against the base of the gland.

The tip of the forefinger of the right hand is then passed through the u thral tear and gradually works its way between the gland and the extern capsule, separating it from this latter covering. During this procedure, the ba is being steadied by the pr tatic depressor pressing up it from within the bladd

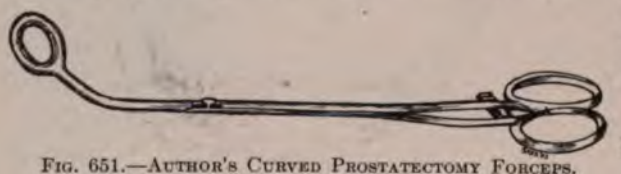


Fig. 651.—Author's Curved Prostatectomy Forceps.

The depressor, owing its curve, can be held the upper part of the pe neal opening, entirely out of the way of the finger, and does not interfere wi it. When the lateral lobe is freed, the prostatectomy forceps (Fig. 651) a placed upon it and it is delivered (Fig. 652). At times, the base of t gland cannot be easily freed, in which case, if the forceps are put on and traction made, the finger can break up the adhesions and the lobe can be gently withdrawn. The scissors are then introduced into the prostatic urethra again and the urethral wall over the other lobe is torn through in a similar manner, after which it is enucleated in the way already described. The prostate gland usually comes out in two pieces with a so-called middle lobe adherent to one of the lateral ones, but the middle lobe sometimes remains behind after the two lateral ones have been removed, in which case it can usually be loosened with the finger nails and grasped and brought out b forceps.

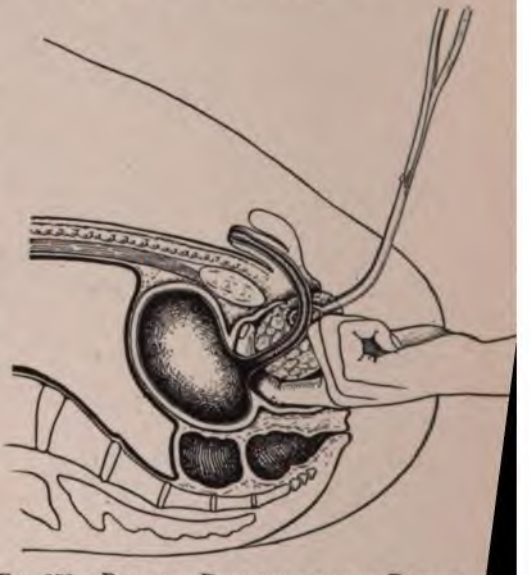


Fig. 652.—Prostate Delivered by the Prostate Forceps. (Author's method.)

The gland having been removed, it is important to apply a pair of forceps to either side of the upper margin of the urethral incision and to the finger around between the urethra and the external capsule and then duce it through the urethra into the bladder to see that everything is free bladder is then flushed out with hot water and, if any calculi are prese are removed. A second irrigation of 1:10,000 bichlorid-of-mercury is then given, and a perineal drainage tube inserted into the bladder the incision. It must be remembered that the artery forceps just re should be allowed to remain on the upper edge of the incision until the

drainage tube has been introduced into the bladder, as it often is extremely difficult to make it pass through the urethra if its floor is not under control, besides which there is danger of tearing the canal or introducing the tube between the urethra and the external capsule. It occasionally happens after performing a very rapid perineal prostatectomy in this manner, that it requires more time to introduce the drainage tube than it did to perform the operation. A large gorget passed in over the end of the forceps facilitates the introduction of the tube. The skin of the perineum is then closed tightly up to the tube and the operation is complete. The tube remains in the same position that it does after an ordinary external urethrotomy. It is removed at the end of a week, after which a large-sized catheter is passed through the entire urethra into the bladder and allowed to remain until the urethra closes about it and the perineal opening has filled in. The care of the bladder is the same as in any other condition in which a catheter *à demeure* is left *in situ* for the same length of time.

Suprapubic Prostatectomy.—The suprapubic operation coming as it did from two men living widely apart—Bellfield and McGill, in 1887 and 1888—so shortly following Von Dittel's work in perineal prostatectomy and just antedating the operation of Zuckerkandl in 1889, gave rise to an increased interest in prostatic surgery. Both Bellfield and McGill performed a suprapubic cystotomy and removed pieces of the prostate that were obstructing urination until they succeeded in taking away most, if not all, of the gland. McGill cut away projecting middle lobes, when present, with curved scissors and then worked his finger into the prostate through the incision he had made and began the process of enucleation. He reported having removed, in this way, pieces varying in size from a bean to that of a cricket ball, the latter of which must have been quite a successful prostatectomy.

Bellfield, in addition, introduced perineal drainage by performing a perineal urethrotomy and passing a large tube into the bladder.

A new era was introduced in suprapubic prostatectomy in 1895 by Fuller, who enucleated the lobes in their entirety, at the same time pushing with his fist in the perineum for the sake of counterpressure (Fig. 653).

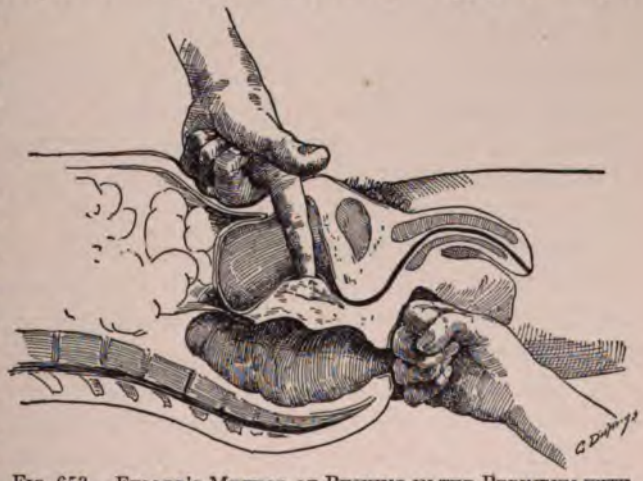


Fig. 653.—Fuller's Method of Pushing in the Perineum with the Fist in Prostatectomy.

Fuller performed his operation along better surgical lines by working his finger into the lines of cleavage between the external and internal capsule and thus making the work both easier and quicker. At the time that Fuller was doing his pioneer work in enucleation, I had the same genito-urinary service at the City Hospital, and we were both teaching at the Post-Graduate Medical School. I therefore had a good opportunity of watching his prostatectomies. In performing prostatectomy on my own cases, I closely followed his technique with the exception that I exerted pressure on the gland by means of the fore and middle fingers of the left hand in the rectum instead of by the fist in the perineum (Fig. 654). By the introduction of the fingers of the surgeon into the rectum of the patient, much of the difficulty of the original operation vanishes, the procedure becomes a much simpler and easier one, and the combined recto-vesical operation (as described by me in August, 1900, at the International Medical Congress in Paris) is the present ideal operation generally known as suprapubic prostatectomy. This method has many followers, among them Freyer of London and Deaver of Philadelphia.

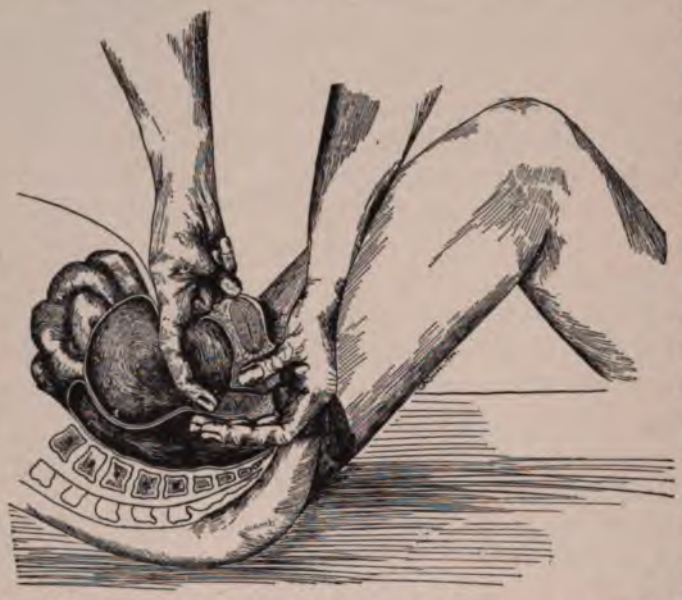


Fig. 654.—Guiteras Method of Putting the Fingers into the Rectum and Pushing the Prostate Up.

Fig. 654 is a picture which appeared twelve years ago in the *New York Medical Journal* (December 8, 1900) of the suprapubic enucleation which I described in August of that year at the Medical Congress at Paris and which I had advocated some time previous.

In going over the text of the operation at that time, one reads:

"Personally I am in the habit of performing prostatectomy by what I call the recto-vesical method, although no part of the operation proper is performed by the rectum, the fingers simply being inserted into it to exert counterpressure and to guide the operating finger, which is working through the bladder. . . . A pair of scissors are inserted into the bladder, the closed blades being pressed against its floor in the region of the vesical neck in the median line, until the

blades are felt depressing the prostate against the two fingers of the left hand in the rectum, which are in turn pressing upon the gland in the median line from below, showing exactly whether the scissors are in the right position or not. The blades of the scissors are then opened, and a tear is thus made through the bladder tissue covering the gland in a line corresponding to the space between the two fingers in the rectum. The forefinger of the right hand is then inserted into this cut through the bladder and gradually works its way between the capsule and the gland; the two fingers in the rectum feel the one in the bladder working its way between the capsule and the gland and they maintain counterpressure, while the enucleation is being performed. The finger tip under the capsule first sweeps to one side and pulls out one lateral lobe and then to the other side and enucleates the other, and finally removes the middle lobe; or it first works its way backward under the base of the middle lobe with a dissecting, rotary movement, and then proceeds to enucleate the two lateral lobes."

I make the above quotation that there may be no doubt in the minds of the profession as to the priority of Fuller and myself in this connection.

As to the choice of method for the individual case, perineal or suprapubic, the consensus of opinion shows a decided preference among surgeons at the present time for the suprapubic operation. Some authors have set down definite indications as to the choice of methods, the indications for each depending on the situation, on the feel of the gland per rectum and the feel per urethra, and the results of other features of examination. I have also made out such a table, but my personal experience inclines me to the belief that the suprapubic method is always as easy as the perineal extraurethral operation and much more satisfactory than that of the intraurethral route. I have arrived at these conclusions by trying nearly every method of perineal prostatectomy that has been suggested, besides modifying them in various ways to meet conditions indicated. In cases in which there is reason to suspect malignancy and likelihood of involvement of the adjacent tissues of the bladder or rectum, the perineal extraurethral operation may be the one of choice. It may also be better in large extravesical growths.

So far as the after results of prostatectomy are concerned, all the advantages are with the suprapubic operation.

The sexual function, if active, is often found destroyed or seriously diminished after perineal prostatectomy, but seems in most cases to be uninfluenced by a suprapubic prostatectomy. If the proper lines of cleavage are adhered to, the ejaculatory ducts are not touched, and it is principally when operators, in an attempt to make rapid operations, dig fiercely into resisting prostates, that the harm is done.

The urinary control, which after the perineal operation is so often impaired, either temporarily or permanently, is never affected so much by suprapubic prostatectomy.

Injuries of the rectum have never been reported as occurring during the performance of the suprapubic operation, but it is an accident that not even the most precise care in doing the perineal operation will enable one always to avoid. Suprapubic prostatectomy is preferable on account of its simplicity of technique, the precision of the operation, the perfection of the cure accomplished by it, the advantage of being able to do the operation in two sittings if indicated, the certainty of not injuring the rectum, the absence of the danger of injury to the sexual function and the absolute freedom of any damage to the patient's urinary control. I believe that the sphere of usefulness of the suprapubic method is bound to grow larger and that in the future it will be used as the method of choice for practically all cases of hypertrophied prostate. The contraindications to suprapubic prostatectomy are continually diminishing in importance and the operation is now being performed upon individuals who would have been regarded a few years ago as unfit subjects even for minor surgical procedures. In coming to a decision whether or not to operate on an individual case, other factors than the mere urinary condition should be taken into consideration. The contraindications of prostatectomy are fatty degeneration of the heart, renal insufficiency, progressive spinal cord affections, severe diabetes, small fibrous prostate associated with irritable bladder and arteriosclerosis.

When some years ago I heard and read the reports of the lack of danger, the ease and the wonderful results of the perineal operation, I thought it was my duty to my patients to employ this method; but after a brief experience I felt that, while the perineal route was safer, the results, the aim of the operation, were not so good, and I believed that if I had spent as much time improving my technique in the suprapubic operation as I had in working out perineal procedures, I could have improved my suprapubic prostatectomy materially. I also felt that the glowing reports of the perineal operations had had the effect of booming a newer operation, which was supposed to be so much simpler than the suprapubic, that any surgeon or practitioner thought that he could perform it. The observer saw operations performed, which consisted simply of making an incision into the perineal urethra, incising the prostatic part of the canal, inserting the forefinger into the incision, wriggling it about for a while, and hooking out pieces of gland of varying sizes, inserting a perineal tube into the bladder and allowing the wound to heal. The period of relief following many of these cases was due to the rest in bed, drainage, bladder washing and urinary antiseptics and antispasmodics. But after the patient was up and about, in some cases urinary dribbling or fistulæ were noticed, while there was a return of frequent urination and tenesmus. Many of these patients came to my clinic seeking relief, and I began to think that the reports of the perineal operations were too rosy.

On giving up altogether the infrapubic method and returning to the supra-

pubic method, I performed the same operation that I formerly had, but I tried to arrange the details of my work in such a way that my field of operation would always be exposed to a sufficient degree to see clearly and show the steps of the operation. In order to accomplish this, certain details were necessary, i. e., to have a sufficiently large incision in the abdominal wall; to have the largest possible opening in the bladder, without injuring the peritoneum; to have the bladder wall well retracted; to have the patient in such a position that any accumulation of blood would not interfere with the view of the prostate. I found in working out these points under consideration, that a Trendelenburg table on which the patient's position could be changed to suit the operator, the rectal bag for pushing up the peritoneum and the use of small abdominal pads in the upper wall of the bladder to soak up leakage of blood and solutions are of the greatest convenience, and also freer use of bullet and prostatic forceps.

*Preparation of Patients.*—Little time is required to prepare a patient for a prostatic operation if the kidneys and bladder are in good condition and if there is not much residual urine. Prostatic patients are often sent to surgeons for operation while suffering from an acute attack of urinary retention. Such patients should be handled with the greatest possible care and, if possible, should be placed in the hospital. It is a great temptation for the house surgeon in such a case to draw off all the urine, but if this be done, the patient's kidneys and bladder become congested, and he may die of uremia; or in any case the time required for preparation may be prolonged on account of the congestion of the urinary tract following such sudden emptying of the bladder. It is therefore wiser to treat the patient's bladder according to the rules outlined in previous chapters on Retention of Urine and Catheter Life. Roughly speaking, draw off 16 ounces of urine at the first catheterization, four hours later 12 ounces more, and then retain the catheter, plug it and remove the plug every two hours, allowing 10 ounces to escape each time until the bladder is emptied. It may be advisable never to operate on a patient with a marked degree of retention until he has been broken into catheter life or can pass some urine spontaneously. If the kidneys are affected medically (chronic nephritis), it is advisable to keep the patient on a milk-and-Vichy diet for a few days, and to give any internal medication that is indicated. (See Chronic Nephritis.) If the kidneys are involved surgically (pyelitis, pyelo-nephritis and pyonephrosis), they should be flushed with fairly large quantities of water and such urinary antiseptics as urotropin, salol or the benzoates should be given internally. The urinary antiseptic is given even on the morning of the operation, and I encourage the drinking of water on the part of the patient until an hour before he goes to the operating room.

Operative preparation consists in a calomel purge the day before the operation and a saline laxative the morning of the operation, besides which the

bowels should be thoroughly washed out with salt solution before the patient goes to the operating room.

The bladder should be washed out before the patient is placed under the anesthetic. The catheter should be left in the bladder and the rectal bag inserted. Nitrous-oxid gas and ether are recommended. As the first part of the operation, suprapubic prostatectomy, is the same as suprapubic cystotomy described under Bladder Operations, I will not repeat the figures here.

*Technique of Suprapubic Prostatectomy.*—The patient is placed upon a Trendelenburg table in the dorsal horizontal position and anesthetized. From ten to fifteen ounces of boric-acid solution are introduced into the bladder through the catheter by means of the piston syringe, and the catheter is clamped to prevent the fluid from escaping, care being taken not to exert force, as at times these pathological bladders are very feeble and may rupture. This pushes the peritoneal fold above the pubes. (See Fig. 523.)

The patient is then changed to the full Trendelenburg position (see Fig. 524), after which from eight to ten ounces of fluid are injected into the rectal bag and the tube coming from it is clamped. This reflects the peritoneal fold still farther upward, as is seen in Fig. 525, owing to the pressure of the dilated rectal bag upon the bladder which flattens and elongates it. Everything is now ready for the operation, and the operator and his assistants take their places about the patient. (See Fig. 526.) In thin subjects the dilated bladder can often be plainly seen through the abdominal wall.

An incision is now made in the median line, from the pubes toward the umbilicus, about four inches in length. (See Fig. 527.) This cuts through the skin and fascia down to the rectus muscle. The fibers of the muscle are then split, showing the peritoneum, the peritoneal fold and the fatty tissue over the bladder. The sides of the muscle and fascia are now gently retracted. The operator now takes a piece of moist or dry gauze and wipes the tissues away from the bladder with an upward movement, from just beneath the pubes until he has come down to the bladder wall. He then continues to wipe up fat and the peritoneal fold until he has sufficient bladder area exposed for the operation (see Fig. 528), or the resistance is so great that he fears he may injure the peritoneum by trying to push up the reflection still farther. I personally prefer to do this with a piece of moist gauze rather than with my finger alone, as I was formerly accustomed to do. When there is considerable pericystitis I often use dry gauze, although I feel that there is more danger of injuring the peritoneum with dry gauze than with moist gauze.

After the peritoneum has been pushed up as far as desired, the bladder wall is seen as a globular mass with engorged veins. The bladder wall is grasped at this point with the bullet forceps and a traction suture passed through the walls. Then the bladder is punctured just below the traction suture, which marks the reflection of the bladder peritoneum upward in the median line and

an incision is made down to the pubes. (See Fig. 529.) The gush of fluid from the bladder wall is very pronounced and it is sometimes very bloody. A traction suture is then passed through either side of the bladder wall and the wall is held open by retractors. (See Fig. 530). The rectal bag is then removed.

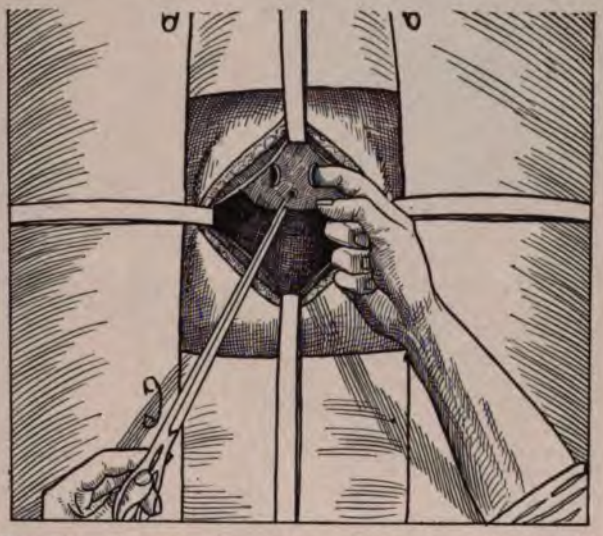


FIG. 655.—GUITERAS OPERATION. Shows the patient in full Trendelenburg position, the bladder open and the prostate grasped by bullet forceps.

Up to this point the steps of the operation have been the same as in suprapubic cystotomy. The prostate should then be grasped by means of bullet forceps, one blade being in the urethra and the other behind the prostatic base in the median line. Two fingers of the gloved left hand are now inserted into the rectum, and the prostate pushed toward the incision in the bladder. At this time, with the bladder retracted, the prostate held upward from above by the bullet forceps, and pushed up from the rectum by the fingers of the other hand, the best possible view of the gland can be obtained, and I have at times been able to bring the gland out to such a degree that part of it has been beyond the surface of the abdominal wall. The position

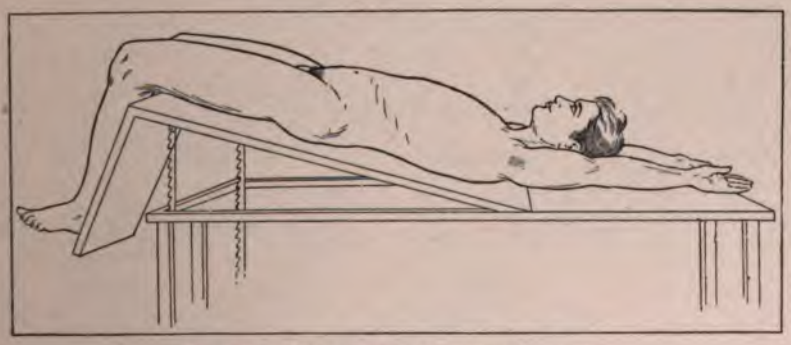


FIG. 656.—HALF TRENDELENBURG POSITION.

of the patient keeps the prostatic field clear at this time, as, if there is any bleeding, the blood will gravitate away from it and be absorbed by the gauze pad in the upper part of the bladder. The bullet forceps are now removed.

A vertical incision can now be made over each lateral lobe of the gland at the urethral margin, or a transverse incision can be made posteriorly, just at the margin of the meatus through the mucous coat down to the capsula propria of the prostate (Fig. 655).

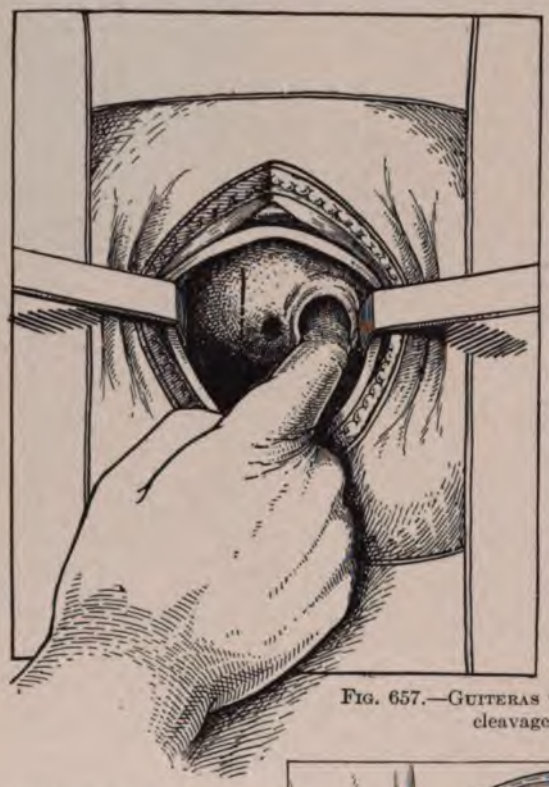


FIG. 657.—GUITERAS OPERATION. The finger entering the line of cleavage outside of the capsula propria.

The patient is then lowered to a half Trendelenburg position (Fig. 656), and the forefinger of the right hand works its way through the incision at the urethral margin into the line of cleavage between the capsula propria of the prostate and its external capsule (Fig. 657), and along the line of cleavage until it reaches the place on which the fingers in the rectum are pressing (Fig. 658). After one lobe of the gland has been separated from the capsula propria, it is hooked out and delivered into the bladder by the enucleating finger (Fig. 659). It sometimes happens that the adhesions are such that the lobe cannot easily be delivered and it remains hanging about the finger so that it is necessary to hold it by means of prostatectomy forceps (Fig. 660), while the adhesions are being separated,

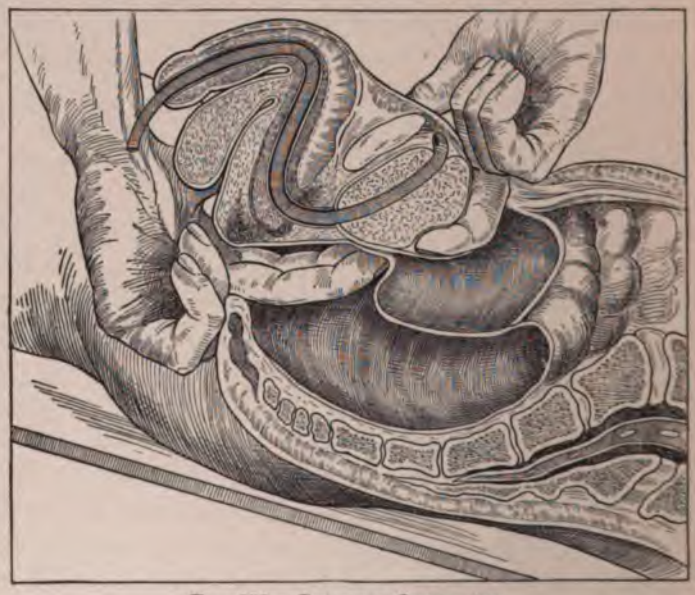


FIG. 658.—GUITERAS OPERATION.
Position of the finger working about the prostate above.

after which it can be drawn out from its loge and delivered (Fig. 661). After the lobes of the gland have been delivered, any remaining adherent pieces should be separated and removed with the finger or dull-pointed, curved scissors, with the aid of forceps if necessary.

*Drainage after Operation.*—An elbowed rubber catheter (23 French) with two eyes is then inserted into the bladder through the urethra, and another straight soft-rubber catheter (38 to 40 French) through the suprapubic incision, in such a way that the vesical ends of the two tubes are in contact with each other. I sometimes attach them with a piece of fine catgut. I often use two smaller suprapubic tubes, between 20 and 30 French in size, instead of one large tube. The large suprapubic tube should be from 6 to 8 inches long and should have an eye in the end and another in the side near the end.

The bladder and fascias are then closed with No. 2 chromic catgut interrupted sutures down to the tube, and the skin by plain gut. A thin piece of gauze is left down to the bladder wall along the side of the tube. The

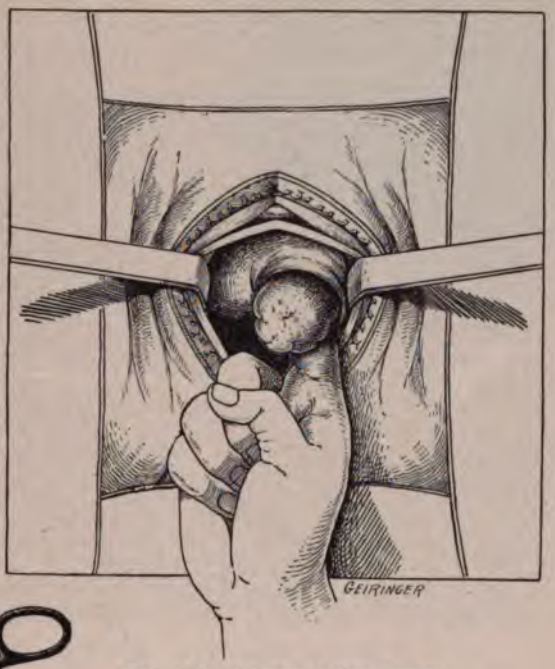



Fig. 659.—Guiteras Operation. Prostate lobe being delivered in the bladder.

Fig. 660.—Author's Straight Prostatic Forceps.

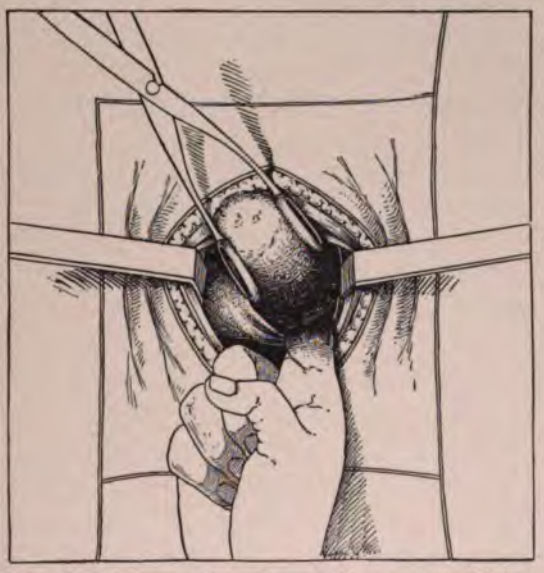


Fig. 661.—Guiteras Operation. The prostatic lobe delivered and being withdrawn by the prostatectomy forceps.

tube is attached to the bladder by a plain catgut suture. The bladder is drained by siphon through the suprapubic tube and the retained urethral catheter is corked (Fig. 662).

Fig. 662.—Drainage after Prostatectomy.

The suprapubic catheter should be arranged by connecting it by means of a glass coupling to rubber tubing, going over the edge of the bed into a large bottle tied to its side, containing a pint of antiseptic solution. The tubing must be supported by pins attached to the sheet in such a way as not to drag on the tubes in the bladder. The care of the drainage is the same as after any suprapubic cystotomy.

A large combined dressing is placed about the suprapubic tube which soaks up any urine escaping by its side and later, after the tube has been removed, it absorbs any urine leaking from the wound. The dressing is held in place by tapes tied over it which are attached to the strips of adhesive plaster fastened to the sides of the body. These are changed as often as they are wet through.

*After-treatment.*—The bladder is flushed out from above or below three times a day, or oftener if the drainage is not good, with boric-acid solution or one of 1 : 4,000 nitrate of silver. The fluid runs in through the tube above and out from the tube below, or *vice versa,* to suit the case. When the urine draining away ceases to be bloody, the suprapubic tube is removed, while the urethral catheter remains *à demeure* until the suprapubic wound is closed. The suprapubic catheter usually remains in for two to four days, when it is removed and a piece of a smaller catheter introduced for a few days more, during which time the patient drains above into the suprapubic dressings, or below through the urethral catheter. After the suprapubic opening in the bladder has healed, as shown by the fact that the urine no longer leaks away, the urethral catheter can be plugged and the plug withdrawn as often as necessary to empty the bladder, care being taken not to allow sufficient urine to accumulate to force open the bladder wound.

The patient is usually out of bed in one week, and out of the hospital in three weeks. He may be up and about his room a few days after the operation. I do not consider this good surgery, however, as stitch abscesses and ventral hernia are more liable to occur. It is also extremely dangerous in the case of heavy men with weak heart action.

The patient can then sit in a chair or slowly walk about the room, with a retained catheter in his bladder, in which case he should drain through the catheter into a glass duct, attached to a piece of gauze encircling his body. (See Fig. 155, Vol. I.)

It is, in my opinion, a very important point to use a retained urethral catheter after the operation, as the drainage from it is as efficient as from a perineal tube through a urethrotomy incision, and the space left after the removal of the prostate has a good-sized object in the prostatic urethra around which to fill in during the process of healing.

For fuller details of the after-treatment see the Operation of Suprapubic Cystotomy. Prostatectomy is really a variety of suprapubic cystotomy and the two should be described in a common chapter on vesical and prostatic operations.

After every prostatectomy, it is desirable to stimulate the kidneys as soon as possible, and to bring the stomach into a receptive condition. This is most easily done by giving the patients large quantities of water to drink. It is remarkable how much fluid can be tolerated in this way, patients sometimes taking over a gallon of water during the first twelve hours after the operation. This improves the drainage very materially, as the wound is constantly washed from within outward. The use of the urinary antiseptics is at once resumed, five grains of salol or ten grains of urotropin or benzoate of soda every four hours for the first twelve hours, and then the dose is cut down one half for the next few days.

The patient is on a liquid diet for the first four days, and after this he is put on a soft, light or regular diet, if there are no complications. The bowels are moved on the second day after the operation.

*Conclusions.*—In closing, I will say that suprapubic prostatectomy holds the same relation to the perineal operation that abdominal hysterectomy does to the vaginal, in that it is a better surgical procedure; that the changing of the patient's position simplifies the different steps of the operation; and that in most cases suprapubic prostatectomy is preferable to the perineal on account of the ultimate operative results, the purpose for which the operation is performed. Practitioners ask: Then why advocate an operation in which the mortality is greater than by the perineal route? The answer is: Why are prostatics operated upon? It is to relieve them of certain annoying symptoms and dangerous complications, and to restore to them as nearly as possible normal spontaneous urination. These results are best obtained by the suprapubic

method. I have arrived at these conclusions after fifteen years of operating on prostatic cases, during which time I have investigated very carefully both the perineal and the suprapubic operations.

*Complications during Operation.—Pericystitis* is a condition that interferes considerably with prostatectomy. It renders it difficult at times to push up the peritoneum from the bladder, thus predisposing to traumatism and to peritonitis. In two patients on whom I operated, the bladder was so friable that, in pushing back the peritoneum, a piece of the bladder wall came away with it and my fingers pushed down through the mucosa into the bladder cavity as they would through a piece of wet paper. It had no bad effects, however, and the bladder wall was closed with Lembert sutures.

*Complications after Prostatectomy.—Shock* is usually due to the rough manipulation of the parts, for it must be remembered that this is one of the most sensitive centers of the body, which is richly supplied by nerves from the sympathetic system. I have noticed that during this operation the condition of the patient often changes suddenly after the enucleation of the gland and I well remember the expression of one of New York's most expert anesthetists, who, while holding the cone with one hand and the patient's pulse with the other, remarked, as I suddenly removed the gland, breaking up adhesions that held it to its bed: "He must have felt that." The patient's pulse had suddenly gone up and become irregular, and then had steadied itself at an increased rate. It was shown that we must be prepared to act quickly at the time if the case is doing badly, and anticipate shock by hypodermics of strychnin and a hot saline enema.

It is always advisable, in operating on prostatics, to be on our guard against shock and to give a hypodermic of strychnin before the patient leaves the table. Some time ago, in operating on a patient fifty-five years of age, with a well-marked intravesical growth easily enucleated, the patient was returned to bed in good condition with his pulse between 80 and 90. A few hours later, with no warning, he sank into a collapse, requiring hypodermics of strychnin, saline enemas with whisky and coffee and hot bottles. If he had had strychnin before leaving the table, and a hot saline enema with whisky immediately after being put to bed, he probably would not have suffered from shock.

*Hemorrhage* is also greatly feared by practitioners beginning prostatic work, as the operation often seems bloody on account of the mixture of blood with solutions. Personally, I have never had bad hemorrhages, although they have seemed to be so at times to the onlookers. Very hot water should be irrigated into the prostatic nest after the removal of the gland in case hemorrhage is present. If the bleeding continues, the cavity should be dried and peroxid poured in. The adrenalin used in the case of hemorrhage from the prostatic nest after the gland has been removed can be the pure standard commercial solution of Parke, Davis & Co. (1 : 1,000), or one ounce of the Parke-Davis solu-

tion in 2, 4, 8 or 10 of normal salt solution. When there has been much hemorrhage, either during or after operation, from 500 to 1,500 c.c. of an intravenous infusion (injection) can be given, composed of ʒj of standard adrenalin solution to a quart of normal salt solution. I have never had to employ adrenalin. If the hemorrhage worries the operator, it is advisable either to make a perineal incision and insert a "catheter en chemise," by which is meant a large perineal drainage tube passed through the incision with a piece of gauze attached to it, to be packed into the prostatic nest from below, or to open the suprapubic wound and pack from above, thus making pressure in the nest of the prostate, represented by the external capsule. The latter method is generally used. These hemorrhages are due generally to excitement on the part of the surgeon on account of a desire to make a rapid and showy operation. If the operator proceeds slowly, and works his finger into the proper line of cleavage, a hemorrhage will rarely occur, unless the growth is malignant.

After the operation, if hemorrhage continues and the patient has lost considerable blood or has suffered from shock at the time, it is advisable to give $\frac{1}{30}$ of a grain of strychnin every four hours and an enema of a pint of hot saline solution containing two ounces of whisky every four hours alternating, so as to have one or the other every two hours. In case the patient does not respond quickly and his pulse causes alarm, the operator should not wait for developments, but should quickly give an intravenous injection of 16 or more ounces of hot saline solution. (See Intravenous Injection, Vol. I.) The same treatment can be given for shock.

Epididymitis sometimes, but rarely, occurs. It should be treated by ichthyol ointment, fifty per cent, and the testes supported.

In the uncomplicated case, the diet should be one of milk and Vichy, or broths. After the bowels have moved, which usually takes place on the second day, the patient can be given soft diet. On the second day following the operation, calomel should be given in small doses, $\frac{1}{10}$ of a grain every hour for ten doses or $\frac{1}{4}$ of a grain for eight doses. On the same night or early on the following morning a saline laxative, sulphate of magnesia $\frac{1}{2}$ ounce, or Apenta water 6 ounces, or Carabaña 3 ounces, should be given and followed later by a cleansing enema. After this, in case the bowels are sluggish, the patient should be given 6 ounces of Apenta water every morning, to be followed in three quarters of an hour by a coffee-and-milk breakfast, and one hour later, in case the bowels have not moved, by a soapsuds enema. If the patient's bowels have been well moved by calomel before the operation, and plenty of water has been given before and after it, the patient will usually have but little trouble. The symptoms that trouble the surgeon are principally noted in cases of hasty preparation, and then all is not plain sailing. These symptoms consist of vomiting, gas and hiccoughs. When *vomiting* and *distention* occur, the water by mouth

already spoken of can be continued for a while, even if the patient vomits it up, as it washes out his stomach.

If the patient does not stop vomiting, however, water by mouth should be discontinued and, if pieces of ice dissolved in the mouth do not relieve him, it is advisable to give small doses of sulphate of magnesia, a drachm every half hour. If the stomach will not retain the magnesia, it should be washed out, after which this dose of magnesia will probably be tolerated. If it is not, half a grain of cocain should be given by mouth. As soon as the stomach is quiet, the sulphate of magnesia should again be given. If no result is obtained, and there is considerable gas present, an enema of 2 drachms of turpentine, ½ ounce of tincture of asafetida, 8 ounces of molasses and 1 pint of milk should be given. This usually removes gas from the intestines, after which salt solution to be retained can be given by enema.

If the sulphate of magnesia is not tolerated, calomel can be started in $\frac{1}{10}$-grain doses every hour, until a grain has been given, to be followed by a saline laxative. During this time, enemas of salt solution or soapsuds, or the mixture mentioned below, can be given to remove the gas.

If *tympanites* is present, without vomiting, it can often be relieved by giving the following mixture for gas:

| | | | Grams. |
|---|---|---|---|
| ℞ | Resorcin | grs. v | .32 |
| | Tr. nux vom. | ♏ v | .32 |
| | Sirup. zingib. | ʒss | 2 |
| | Peppermint water ... q. s. ad | ʒij | 8 |

To be taken at one dose every three or four hours.

A urinary antiseptic powder of urotropin and benzoate of soda, each 10 grains, may also be given every three or four hours, alternating with the gas mixture.

The patient should be given small quantities of milk and Vichy, beginning with one ounce of each every hour, and increasing gradually. It is advisable, in a milk-and-Vichy diet, when patients are full of gas, to keep them on small amounts for several days, as the stomach will not tolerate larger quantities in these cases of gastro-intestinal irritation, and it is sometimes three or four days before they can take an ounce and a half of each hourly without some gastric disturbance. But usually after this, it can be increased to two ounces and so on in larger amounts at less frequent intervals. Small quantities of broth can also be given, if tolerated. While on this milk-and-Vichy diet, a bismuth-and-pepsin powder composed of 20 grains of subcarbonate of bismuth and 10 grains of pepsin, can be given every three to four hours. At the same time, the urinary antiseptic powder and the so-called antigas remedy of resorcin, nux vomica and ginger, should be continued. On this very low régime, it is sometimes, although very rarely, a week or more before the patient can be given a soft diet.

One of the most trying of all complications that befall a patient after prostatectomy is *hiccough*. This occurs sometimes in cases of pericystitis, due to traumatism of the peritoneum, usually in pushing it up sufficiently high to give the desired space in the bladder wall for the suprapubic incision. Such mild remedies as 5 drops of chloroform spirits in water, or 3 drops of oil of wintergreen on a lump of sugar, will sometimes relieve it. If not, morphin, $\frac{1}{6}$ of a grain every six hours by hypodermic, may do so. The most reliable remedy, however, is a combination of morphin, $\frac{1}{8}$ of a grain, with hyoscin hydrobromid, $\frac{1}{150}$ of a grain, by hypodermic, every eight hours. Caffein and bromid of sodium, each $\frac{1}{2}$ grain, are also recommended. Should vomiting and hiccough occur together, or in vomiting alone, when very small doses of milk and broth are not tolerated, rectal feeding should be employed for a few days.

Gaping of the wound and exposure of the peritoneum sometimes occurs after these operations, usually due to using plain gut in closing the abdominal fascia above the tube. It is, therefore, advisable to use always No. 3 chromic gut in bringing the fascia together and then to fortify it further by passing a narrow strip of adhesive plaster across the abdomen from just below the crest of the ilium on one side, to a corresponding place on the other side.

Two-stage Operation.—The two-stage method recommended by Lilienthal is of great value in a certain class of patients who are in need of relief, but whose physical condition is such that any surgical procedure would be dangerous to life. The results are generally very satisfactory and the method has undoubtedly increased the usefulness of the suprapubic operation. The first stage consists of a *suprapubic cystotomy* and drainage, which may be accomplished under local anesthesia in a few minutes. The patient is allowed to go for a variable length of time, depending on the conditions in the particular case. The period between the two stages is usually from three to four days to two weeks, and in some cases even longer.

The second stage consists of the *enucleation of the prostate*, which is done along the same lines as described in the operation of suprapubic prostatectomy, except that the attempt is made to accomplish this under nitrous-oxid or chloroform anesthesia as quickly as possible. The other details and after-treatment are the same as in the original operation.

Results of Prostatectomy.—In 1890 at the International Medical Congress in Paris, at the meeting at Necker Hospital, I said, in closing, that prostatectomy was in the same position as hysterectomy was a number of years before, and that in a short time it would be just as well understood as hysterectomy. This period has arrived. There is probably in latter-day surgery no greater example of the progress made in surgical science and art than that of prostatectomy. To such perfection and simplicity of technique has the radical operation for the cure of prostatic hypertrophy been brought, that it has practically superseded all other methods of treatment. As the number of prostatec-

tomized individuals grows daily greater, the contraindications to and the mortality from prostatectomy are diminishing in proportion. A computation of the mortality, from the modern operation, covering several thousand cases in the hands of different surgeons, and performed by various modifications of technique in different countries, is fractionally lower than nine per cent, but a number of surgeons especially skilled in this particular line of work have reported a considerably lower mortality in chosen cases. In this computation, the patients average almost seventy years of age, a number of them being between eighty and ninety and some of them over ninety. All of the patients had suffered for a number of years more or less, not only with the difficulties and consequences of the urinary obstruction, but also with the chronic urosepsis which is so important a part of the picture of hypertrophy.

A condition that is so often lost sight of is that many of the patients have some complicating chronic disease, usually of the lungs, the kidneys or the circulatory system, and from twelve per cent to twenty per cent of the cases are malignant.

When the medical profession once realizes that hypertrophy of the prostate is not always a hopeless condition, but one that sometimes, with but slight risk, is permanently relieved or completely cured, the patients will go to the surgeon at a much earlier stage than at present; for now cases are frequently not seen until it is too late for a successful prostatectomy.

With this factor in their favor, and with the improvement in anesthesia and operative technique, there is abundant reason to prophesy that in the not remote future the mortality from prostatectomy will be still further lowered.

## MALIGNANT TUMORS OF THE PROSTATE

**The Operation for a Bladder Valve (Gibson's Operation) in Cases of Inoperable Malignant Growths of the Prostate.**—The steps of the operation are as follows: First a suprapubic cystotomy, the incision into the bladder being just large enough to admit a No. 30 catheter (French scale). The No. 30 soft-rubber catheter is introduced through the incision into the bladder; the incision is then closed by a No. 2 chromic-catgut suture above and below the catheter and the instrument is made fast to the bladder wall, after which two Lembert sutures are passed through the vesical wall both above and below the catheter, as in Fig. 663. The sutures are tied and the bladder wall between them is thus invaginated into the bladder along the catheter and four more Lembert sutures are passed, two above and two below the catheter (Fig. 664). These are then ligated, invaginating the bladder still more. The skin sutures are then introduced (Fig. 665). The skin is sewed up to the tube on either side and the valve is seen in the bladder from a posterior oblique view (Fig. 666). At the end of a week the No. 30 French catheter can be replaced by a No. 25 French,

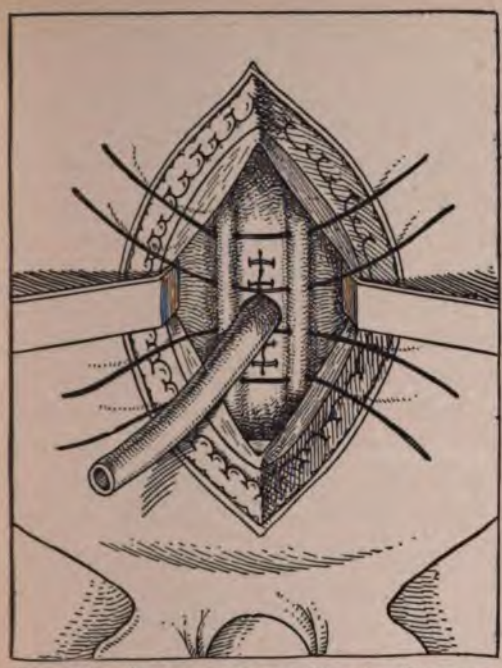


FIG. 663.—OPERATION FOR A BLADDER VALVE IN INOPERABLE MALIGNANT GROWTHS OF THE PROSTATE. Showing the tube in place, two fixation sutures tied above and below the tube and four Lembert sutures passed and ready to tie, two above and two below the tube.

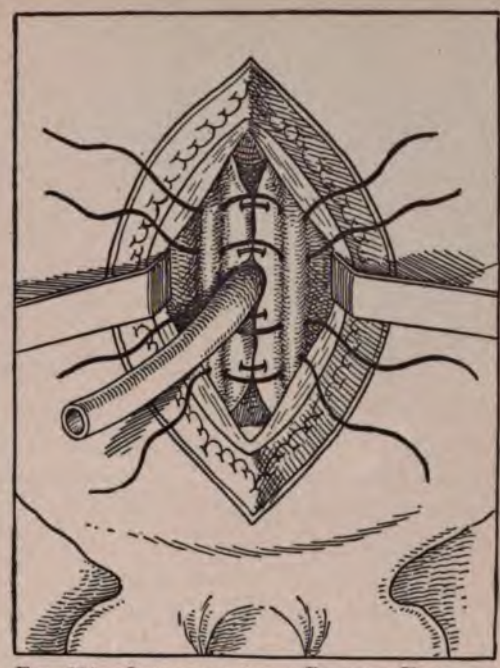


FIG. 664.—OPERATION FOR A BLADDER VALVE IN INOPERABLE MALIGNANT GROWTHS OF THE PROSTATE. Shows the first layer of invaginating Lembert sutures and four more passed and ready to tie above and below the tube.

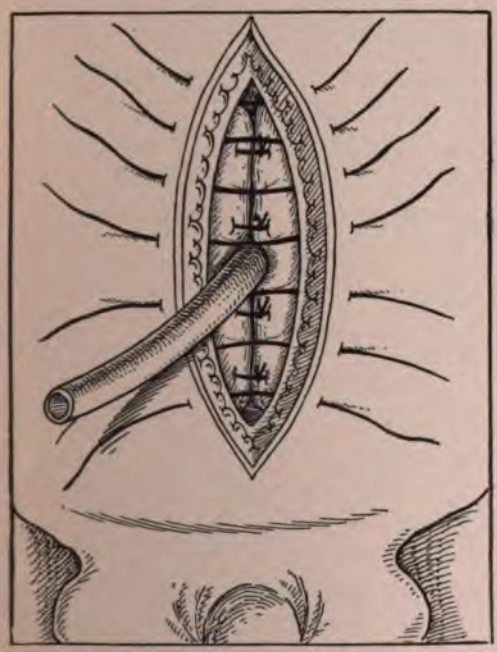


FIG. 665.—OPERATION FOR A BLADDER VALVE IN INOPERABLE MALIGNANT GROWTHS OF THE PROSTATE. Shows the second layer of invaginating Lembert sutures tied and the skin sutures passed and ready to tie.

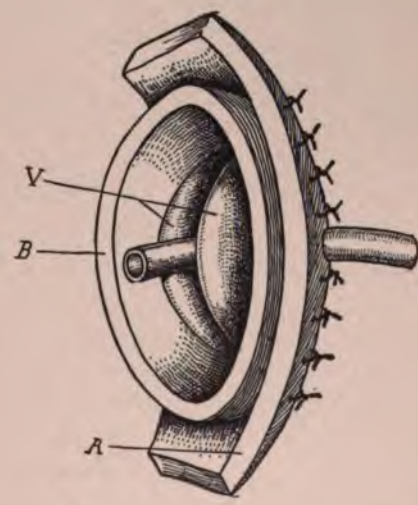



FIG. 666.—OPERATION FOR A BLADDER VALVE IN INOPERABLE MALIGNANT GROWTHS OF THE PROSTATE. *A* shows the fascia and skin sutures tied; *V*, an oblique view from behind of the invaginated portion of the bladder forming the valve; *B*, bladder wall.

and at the end of another week by a No. 20 French. The valve will shortly afterwards be able to hold urine.

The results of this operation are that the patient can urinate through the urethra whenever he feels the desire, and the residual urine can be drawn off night and morning, or as often as necessary, by passing a catheter through the valve. On withdrawal of the catheter, the invaginated walls of the valve come together again and there is no leakage. The catheterization of the patient through the urethra for partial and complete retention of urine, often giving rise to traumatism of the urethra, hemorrhage, epididymitis and urethral fever, is no longer necessary and the bladder is at all times at the command of the patient. As long as the patient can pass urine through the urethra, he may continue to do so; but as the urethra becomes more and more obstructed, catheterization through the valve will have to be relatively more frequent. There is a tendency on the part of the valve to close, and occasionally it has to be stretched by an Oberländer dilator or some other dilating instrument. The best catheters to use for catheterization through the valve are the straight soft-rubber and the olivary-tipped woven variety.

# CHAPTER LIV

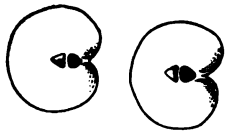
## ANOMALIES OF THE URETHRA

### EXAMINATION OF THE URETHRA

THE examination of the urethra has been considered in the first part of this work, in the chapter on Examination of the Patient. It consists principally of palpating the canal as far as possible and examining it for obstructions from the external to the internal meatus by means of bougies à boule, sounds and catheters. The inspection of the canal is carried on with the aid of a urethral speculum and a urethroscope. It seems advisable to me to incorporate the instrumentation of the urethra in the chapters on Stricture and Chronic Urethritis, as it is in these diseases that the instruments referred to are used, not only for examination but also for treatment.

### ANOMALIES OF THE MEATUS

The meatus normally terminates at the tip of the glans as a vertical slit bounded by a lip on either side (Fig. 667). At times, however, it is not so placed, but is situated nearer the upper or lower surface (Figs. 668 and 669).



**Size.**—The normal size of the meatus in the adult is that which will admit a 28 to 30 French sound or bougie à boule, while anything smaller than this can

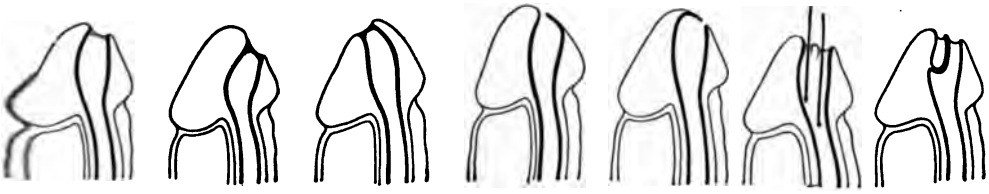


FIG. 667. FIG. 668. FIG. 669. FIG. 670. FIG. 671. FIG. 672. FIG. 673.

NORMAL MEATUS AND MALFORMATIONS.

FIG. 667.—NORMAL MEATUS.
FIG. 668.—MEATUS LOW DOWN.
FIG. 669.—MEATUS HIGH UP.
FIG. 670.—MEMBRANE COVERING LOWER HALF OF MEATUS.
FIG. 671.—MEMBRANE COVERING UPPER HALF OF MEATUS.
FIG. 672.—URETHRAL LATERAL BAND DIVIDING THE MEATUS IN TWO.
FIG. 673.—URETHRAL CUL-DE-SAC AT MEATUS.

be spoken of as a stricture, although an opening over 22 French in size rarely gives rise to any disturbance. When, however, the size is between 12 and 22 French, symptoms do result. A meatus under 15 French is rarely seen. A small urethral opening may be slightly below or above the point of the glans on account of the lower or upper portion being formed of a thin membranous tissue which, if cut through, would reveal a meatus of normal size (Figs. 670 and 671). A true congenital stricture is either a smaller opening than usual at the end of the canal but having the same thickness of tissue about it that is found normally; or else a meatus with an unyielding linear narrowing around it.

**Abnormalities Just Inside the Meatus or its Lips.**—In some cases the meatus seems normal to outward appearance and yet, when its lips are opened, a membranous band or wall is found extending across a part of the canal. In the case of a band, the urethra is generally divided into two parts at this point, the lower opening being usually the main one (Fig. 672).

In the case of a membranous wall, this may be either flat membrane or a cul-de-sac. In the first case it resembles closely the membrane covering a part of the meatus at a level with its surface. When a membranous cul-de-sac exists, the tissue is looser and can be pushed down in the center or inverted, forming a bag or a blind sac into the end of which an instrument can be inserted but will find no exit (Fig. 673).

**Congenital Stricture of the Meatus.**—The meatus may be the narrowest portion of the urethra without interfering with the act of micturition. Frequently a narrowing of the canal is found, 4 or 5 millimeters behind the urethral opening, that is smaller than the meatus itself. This is usually congenital, and when below 28 French in size is spoken of as a stricture. Such a congenital narrowing is linear in character, usually situated just in front of the fossa navicularis and does not necessarily give rise to pathological symptoms, although in certain cases of obstinate chronic urethritis the obstruction may be sufficient to cause its chronicity. Such a narrowing, like that of the end of the urethra proper, may also occasion bladder strain, showing itself as nocturnal incontinence in children and frequent urination as they grow older. In adult life it is probably the most frequent predisposing cause of cystitis. In many cases of irritable bladder in individuals who have never suffered from any urethral or bladder disease, I have found marked vesical trabeculation present on performing cystoscopy after a meatotomy.

**Treatment.**—The treatment of congenital deformity of the meatus, causing a diminution of the caliber of the canal at the meatus proper or just behind it, calls for an incision of the meatus in the median line, meatotomy, in such a way as to leave an opening of normal size after the wound has healed. (See chapter on Operations for Stricture of the Urethra.)

## TOTAL ABSENCE OF THE URETHRA

This condition is fortunately extremely rare, and but one case, that of Cho part, has been reported.

Partial absence of the urethra is nearly as rare, and, while a source of great inconvenience to the individual, it is not necessarily fatal.

## COMPLETE OCCLUSION OF THE URETHRA

**Imperforate Urethra with no Outlet.**—An imperforate urethra may exist without any exit for the urine, or it may be accompanied by a deviating urinary channel. In the first instance—imperforate urethra with no outlet—the impediment consists in a dividing membrane that shuts off the urethra entirely at some point usually at or near the meatus, or there may be no signs of an opening at the tip of the glans. The cases in which the obstruction exists near the neck of the bladder are much rarer. The occlusions may be multiple, one existing at the neck of the bladder and another at the meatus. The imperforate urethra may also consist of a hard, fibrous cord situated at the site of the membranous urethra. An imperforate anus may occur in conjunction with a urethral occlusion, but with a free communication between the bladder and the rectum. When the urethra is impermeable, the bladder, ureters and kidneys distend, resulting in death from anuria, or perhaps from an intraperitoneal rupture of the bladder, in case no outlet is made by the attending physician.

**Imperforate Urethra with a Deviated Urinary Channel.**—In the second instance—that of imperforate urethra with a deviated urinary channel—the fistulous tract may start in the bladder or in the urethra behind the occlusion. It usually terminates in the rectum when starting in the bladder; whereas it ends superficially on the anterior or posterior part of the penis when it starts in the urethra, resembling an epispadias or hypospadias. The condition of an infant with an imperforate urethra depends upon the character and extent of the anomaly. It is generally noticed shortly after birth that no urine is voided and that the child is in distress. This leads to an examination of the urinary tract and the discovery that the meatus is absent or occluded. In case the meatus is free, the canal should be palpated. If there is a bulging at any point along the urethra it is a sign that the impediment is just in front of it. The canal should then be examined by means of a thin probe bent into the shape of a sound to ascertain if the passage is clear to the bladder. If the probe does not pass beyond a certain point, the place at which it stops is probably the seat of the obstruction, especially if there is a bulging of the tissues just behind this. At the same time, the anus and rectum should be explored to ascertain if they are free and normal. If, on the other hand, an examination of the infant shortly after birth shows the absence of a meatus and no discomfort

is evident it indicates that the urine is escaping by some other channel. If there is a fistulous opening anywhere on the body of the penis or in the perineum or groin, it will be evidence that the urine is escaping at this point; but if no such openings are found, it is probable that the urine is emptying into the rectum and consequently the stools or rectal washings should immediately be examined for urea, the presence of which shows that the urine is discharged into the gut.

When there are no signs of the escape of urine, and yet there is a feeling of distress and a distention just over the pubes, it would point to urinary retention in the bladder with perhaps double hydronephrosis; whereas a general distention of the abdomen would indicate either great vesical dilatation or else a rupture of the bladder and escape of the urine into the peritoneal cavity, or into Retzius's space. In the former case the abdominal symptoms would be grave.

**Treatment.**—The treatment of an occluded urethra is surgical and depends on the character of the obstruction and the associated conditions.

If the meatus is occluded and the urethra is bulging, an aspirating needle should be pushed from the tip of the glans toward the point of distention. If urine escapes through the needle it will be apparent that the canal and the tract made by the instrument are continuous and, after removing the needle, a fine probe or filiform bougie should be passed through the canal and this should be done every night and morning until the opening remains pervious. If the surgeon in charge has no aspirating needle but a knife with a very thin blade, this can be plunged through the tissues in the same way. The same procedure applies to a normal meatus with an occluding membrane just behind it. If, however, the practitioner is working in the country at a distance from a surgeon and must relieve the infant at once, he should cut into the tissues wherever a swelling presents itself, either in the pendulous urethra, the perineum or just above the pubes, as otherwise the child is sure to die.

In case of an imperforate anus, an incision should be made into the space between the scrotum and the coccyx in an effort to find the rectum and to provide an anus. If the attempt to find the rectum in this way fails, the surgeon should then make an incision in the iliac region of the left side, pull out a piece of the sigmoid, wall it off from the peritoneal cavity and incise it as in an emergency operation. The necessary plastic operations can be made later on in the life of the infant or child. In cases of occlusion of the urethra after a fistula has been made, nothing further need be done, as long as the drainage is not interfered with, until later on in life.

## DOUBLE URETHRA

A double urethra, or, perhaps better, a urethra with a "para-urethral" passage, has been recorded five times. In these cases, the urethra is divided into

two passages from the vesical neck, communicating with one another at some point or throughout the length of the penis, both carrying urine. In another instance, one channel may be situated above the other, the supernumerary one being somewhat occluded but readily traced as far as the bladder.

Accessory canals are said to be not infrequent, commonly showing themselves only through the development of gonorrheal trouble. I have noted but one of these conditions, pathologically, and that in the case of a patient who had suffered from urinary extravasation through rupture of the urethra, in which case there was an accessory sinus running along the urethra from the perineum to the side of the frenum through which the patient urinated at the same time that he did through the urethra. This case was presented by me at the Academy of Medicine and will be referred to in the chapter on Urinary Extravasation.

## DILATATIONS AND DIVERTICULA

**Dilatations.**—A congenital dilatation of the urethra is a very rare condition. It consists of a pouch attached to the lower aspect of the canal, varying in extent and involving any segment from the meatus to the perineum. In the collapsed state between the acts of micturition, it hangs loose and wrinkled, while, during urination, it bulges and becomes tense. It is sometimes sufficiently large to hold the entire contents of the bladder. It is easily made to discharge, however, when pressed upon by the fingers. Its communication with the urethra is also shown by its distention when fluid is injected into the anterior urethra. The wall of the pouch consists only of the urethral mucosa and integument. The part of the urethra in front of the dilatation is sometimes strictured, or there may be a valve both in front and behind the pouch. The cause of this condition is an early arrest or error of development. It is very rare, and I have never seen one.

Treatment.—The treatment is surgical. The pouch is carefully exposed and removed. The mucosa and the skin are then united in two distinct layers. In the case of a pouch with a narrow neck, it can be simply ligated close to the skin and the redundancy cut away; whereas, if there is no neck, multiple ligatures can be used and the sac removed. When the pouch is removed by ligature, the tissues should be further fortified by a continuous suture to make better apposition. In any case, a catheter should be left in the urethra after the operation is performed on an adult or large boy.

**Urethral Diverticula.**—Diverticula are not generally noticed until instrumentation is begun for the cure of a chronic urethritis, when it is found that the instrument catches in them and cannot pass through the entire canal. They have also been diagnosticated by the urethroscope. They occur usually in the bulbous portion of the urethra. I have frequently found pockets in this region in operating on cases of stricture through the perineum, but have never had

any proof that they were congenital and have always been led to believe them as artificial in origin.

The one method of treating an anterior diverticulum is to pass a grooved director or probe down the urethra into the pocket and then a knife along its groove and slit the pouch longitudinally. If the diverticulum is in the perineal portion, perform an external urethrotomy, cut through the pocket and then cut away its side. I have often cut through dilatations of this kind when operating on cases of urethritis with stricture, but did not know whether they were congenital or acquired.

## ABNORMALITIES OF THE CONTINUITY OF THE URETHRA

**Hypospadias.**—Hypospadias is a congenital condition in which the urine, instead of coming out of the urethral meatus in the end of the glans, comes out from an opening at some other point on the lower aspect of the urethra.

There are three varieties of hypospadias, the balanic, the penile and the perineal. In the balanic, the opening is in the glans just below the urethral opening, usually at a point corresponding to the frenum or to the fossa navicularis; in the penile, the opening may be at any point between the glans and the peno-scrotal junction; in the perineal, the opening is either in a cleft in the scrotum or in the perineum. Besides these, there are the mixed forms, glandulo-penile, peno-scrotal and perineo-scrotal.

Hypospadias is the most frequent of all urethral deformities, and in fact of all deformities. Its frequency is one third of one per cent.

Etiology.—It may be due to incomplete closure of some point of the urogenital sinus in the period of development. Kaufmann, however, claims that hypospadias depends upon a mechanical obstruction to the functional activity of the urethra after the urinary secretion has been established in the fetus, thus giving rise to urethral retention and rupture. The cicatricial tissue so often found associated with this condition, as well as the flexion, torsion and fissures of the organ and the adhesion to the scrotum, strengthens the Kaufmann claim and makes it accepted by many.

*Balanic Hypospadias.*—In this condition the opening of the urethra corresponds to the position usually occupied by the frenum. It is sometimes small and can be scarcely seen. It is usually transverse in shape and may be multiple. The glans is not as long as usual and there is generally a furrow running from the normal position of the meatus to the abnormal urethral opening. The tip of the glans is often imperforate and at other times there is a meatus at the end of the glans which is either imperforate or open and connected with a blind sac. The prepuce is short and thick at the dorsum, and becomes thinner as it extends around to the urethral opening. The shape of the organ is changed in adults

in that it is bent downward to a variable degree at the hypospadic part, usually but slightly.

*Penile Hypospadias.*—The opening is somewhere between the scrotum and the glans and is oval in shape. The urethral canal is generally absent anterior to the opening and there is a deep groove in its place.

The scrotum, which is situated beneath the urethra and under the arch of the pubes, may be divided into two parts and the corpora cavernosa often appear to be quite separated. Sometimes the urinary canal is fairly perfect anterior to the opening, although the glans or meatus may be imperforate; in other cases it is pervious, but contains numerous strictures. The penis is abnormally short and curved downward.

*Perineal hypospadias* is the least frequent and the most complicated. The scrotum is divided and the opening is in the furrow 3 or 4 centimeters from the anus, of a slit shape with a muco-cutaneous fold on each side, giving it the appearance of a small vagina. The urethral segment anterior to the opening is like that of the last variety. It is usually present and sometimes perfect as far as an imperforate meatus, while in other cases it ends in a blind sac at any point of its course. The penis is short and curved and is bound down below owing to lack of development in the corpora cavernosa. The testes may not have descended and the external genital organs are frequently mistaken for those of the opposite sex, a vaginal opening, labia and a large clitoris.

Symptoms.—In balanic hypospadias, there is but little trouble in urination excepting that the stream is not projected in the normal curve, but tends rather to shoot downward in the direction of the patient's shoes or obliquely forward and downward; but this can be overcome by tilting the organ in the right direction. In penile hypospadias, the stream is projected against the scrotum, unless the organ is held in such a way as to change its direction. The greatest disturbance in urination occurs in the perineal cases, as the membranous urethra and prostatic portion are normal and the stream is projected with force. This strikes the curved organ, and the urine spatters to such a degree as to wet the patient and soil his garments unless he assumes the position common to women when urinating. It is difficult for these patients to keep themselves dry and they usually have a urinous odor and an eczematous condition in the perineum.

Coitus is not interfered with to any degree in the cases of balanic hypospadias and impregnation is usually successfully accomplished. In the penile cases, coitus can often be indulged in quite satisfactorily, but impregnation will not take place in the cases in which the hypospadic opening is situated so far down as to lie outside of the vagina during the act. In perineal hypospadias, however, both the ability to copulate and impregnate is made impossible by the deformity.

Diagnosis.—The diagnosis is not difficult except in infants, in which case the opening may be so small as not to be seen. The act of urination will show this, however, if carefully observed. The sex cannot at times be easily made out in the perineal cases, especially if the testes have not descended, as the scrotum on either side of the cleft resembles the labia and the organ a clitoris, but abdominal palpation, together with explorations by the rectum and bladder, will reveal the presence of a prostate gland in the male or the uterus in the female.

Prognosis.—This condition is not dangerous to life, but it is very difficult to cure satisfactorily, except the cases of balanic hypospadias which do not really need an operation. The operative success of the cases of penile hypospadias have not been, in my experience, satisfactory. The perineal cases are still more difficult to operate upon and the results are much less favorable.

Fig. 674.—Beck's Operation for Hypospadias. First step, marking out the flaps. (From Keen's "Surgery.")

Fig. 675.—Beck's Operation for Hypospadias. Second step, showing the flaps dissected to one side, the urethra freed and the incision up through the glans. (From Keen's "Surgery.")

Operative Treatment.—The treatment of hypospadias is palliative and operative. The technique of the operation depends upon the variety of the deformity. In balanic hypospadias, the hypospadic opening is in the region of the fossa navicularis or the frenum. In some cases the glans is imperforate; or there may be a more or less perfect meatus in the usual situation, ending in a blind sac of varying length; or, what is most common, there is a cleft furrow extending from the normal position of the meatus to the urethral opening. The operation best suited to remedy balanic hypospadias when the glans is imperforate or there is an opening ending in a blind sac, is that of Carl Beck of New York.

*Beck's Operation.*—A transverse incision is made through the skin, across the organ on a level with the hypospadic meatus, corresponding in length to one third of the circumference of the organ at this point, cutting around the border of the opening of the canal as well. A catheter is then passed through the canal into the bladder, and the urethra is fastened to it by a ligature. This serves as a guide in dissecting out the urethra and also assists in keeping it stretched; besides which it prevents urine from leaking on the operative field. A vertical incision is then made through the skin downward along the middle of the canal from the transverse incision to the junction of the middle and posterior third of the organ (Fig. 674). The flap of tissue is then dissected back on either side, freeing any adhesions present and also liberating the canal for the distance of an inch or more. The corpus spongiosum with the urethra is now dissected free and drawn on one side.

The next step of the operation is to insert the end of a pointed bistoury at the line of union of the glans and the corpora cavernosa, in the position formerly

Fig. 676.—Beck's Operation for Hypospadias. The urethra pulled through the glans. (From Keen's "Surgery.")

Fig. 677.—Beck's Operation for Hypospadias. The skin flaps united and the operation finished. (From Keen's "Surgery.")

occupied by the hypospadic meatus of the urethra, and then to push the knife blade through the glans from this point with the blade held transversely until it comes through the end of the glans (Fig. 675). After this it is dilated by means of a urethral dilator or sounds. A pair of thumb forceps is then pushed down through the incision made in the apex of the glans and the end of the urethra, or the catheter contained in it is grasped and pulled through the

incision till the end of the urethra is outside the opening in the glans (Fig. 676).

The end of the urethra is then fastened to the sides of the opening in the end of the glans by four sutures, two above and two below. The skin incisions are then united over the urethra by sutures (Fig. 677).

In case there is a meatus present in the normal position at the end of the glans that is imperforate or connected with a blind sac, the tip of the knife should be pushed through the meatus in the first instance, or through the glans into the blind sac and out of the meatus in the second instance.

*Duplay's Operation.*—Duplay's operation still seems to be the best for correcting hypospadias of the penile urethra. It is a three-step operation. The first step consists in straightening the organ. This is accomplished by cutting the fibrous bands extending along the under portion of the organ between the glans (*A*) and the hypospadic opening (*B*), which are the cause of the curvature. In doing this the organ is put on the stretch, and the point of greatest tension felt for. A transverse incision is made at this point through the middle of the constricting band (Fig. 678, *C D*). In case that this is not sufficient, the tissue can be cut down to the corpora cavernosa, and even through its capsule and into its tissues, as it is most important to have sufficient straightening to obtain a good result, and many surgeons do not cut deep enough. The incision is then closed by transverse sutures and dressed as usual, after which the ordinary surgical dressing is made (Fig. 679). The penis is kept pressed against the abdomen by a bandage so as to keep it constantly on the stretch and to prevent the curvature from recurring. Sometimes small splints are used for this purpose. After six or eight months, the second part of the operation is performed.

Fig. 678.—Duplay's Hypospadias Operation. Straightening the penis. (From Morrow.)

Fig. 679.—Duplay's Hypospadias Operation. Formation of a new meatus. (From Morrow.)

The second step consists in reconstructing the urethra down to the hypospadic opening. In case there is a furrow in the under surface of the glans connecting with the opening behind it, a plastic should be made in the following way: A No. 15 to 25 French catheter should be placed in the furrow to find out its relative size compared with that of the instrument. In case the furrow is found sufficiently large, its edges should be freshened and it should be brought around the catheter and sutured. It will probably be found too small to unite around the catheter and either one or two vertical incisions will

therefore have to be made in the glans to allow for sufficient stretching to accommodate the catheter (Fig. 680, *A*, *B*). I am rather in favor of two small incisions, one on each side of the furrow, than one large one in the middle. These incisions should be made the entire length of the glans. The margins of the furrow should then be freshened by paring off with scissors the united mucous membrane of its edges, after which they should be united by No. 1 chromic gut about the catheter. The catheter is held in place by a safety pin passed through each end.

Fig. 680.—Duplay's Hypospadias Operation. Formation of glandular meatus. *A*, two vertical incisions *a,b*, *a,b*. *B*, incision *a,b,b*. *C*, pin bringing urethra together; *S*, urethra.

The next part of the second stage of the operation consists in making an incision (*aa'*) on either side of the urethral groove extending from the glans down to the hypospadic opening (*z*); the distance between the two incisions being about one third of an inch: a transverse incision is then made at either end of the perpendicular incisions toward, but as not as far as the median line (Figs. 681, *aa* and *a'a'*). After this, two flaps are dissected up from each incision, one being dissected from the incision toward the median line of the penis and the other from the incision in the direction of the sides of the organ. A No. 15 French catheter is then placed in the mid line of the ventral portion of the organ (Fig. 681 A) and the smaller or middle flaps *x* and *y* are lifted over the catheter and sutured (Fig. 681 B). After this, the outside flaps *a* and *b* are lifted

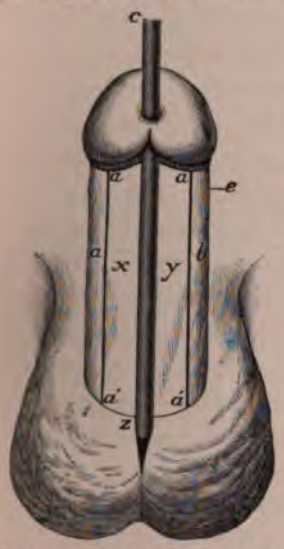



Fig. 681.—Duplay's Hypospadias Operation. Forming the flaps, *x* and *y*. (Bryant.)

Fig. 681 A.—Duplay's Hypospadias Operation. Transverse section showing the relation of the flaps *x* and *y* to *c*, catheter. (Bryant.)

Fig. 681 B.—Duplay's Hypospadias Operation. Transverse section showing flaps *x*, *y* reflected. (Bryant.)

Fig. 681 C.—Duplay's Hypospadias Operation. Transverse section showing flaps *x*, *y* nearly opposed. (Bryant.)

over the flaps $x$ and $y$ on the catheter and united (Fig. 681 C). The coverings of the catheter forming the new canal consequently consist of two layers, an inner layer having skin next to the catheter and an outer layer having skin on the outside. Thus the two raw surfaces are approximated, which favors strong union. A sealed dressing of gauze and collodion is placed on the incision. It is advisable, when performing the second stage of this operation, to unite the balanic part of the urethra already repaired to the new penile portion.

The last or third stage of the operation, the closing of the hypospadic opening, can take place at any time after the second step up to that of puberty in a child, or in a few weeks or months after the second stage in the adult. The steps of this operation will be found in the chapter on Urinary Fistulas, Chapter LXI.

Very often the formation of a new urethra is not successful and a number of operations have to be made. One of the greatest difficulties in after-treatment is combating erections which tend to tear out the sutures, more than any other cause. Large quantities of bromid should be given to prevent this.

**Epispadias.**—This malformation consists of an opening in the roof or upper wall of the urethra, of a greater or lesser extent, from which the urine is voided. It is very rare compared with hypospadias. There are two varieties of this deformity—the balanic, in which the opening is just behind the glans, and the penile form, in which it is situated farther back on the dorsum, frequently just in front of the symphysis. The balanic and penile epispadias are exceptionally rare. The most frequent form is an epispadic urethra combined with bladder extrophy, which occurs in 1 out of every 50,000 infants, ninety per cent of whom die, according to Neudorffer.

Fig. 682.—Epispadias. (From Desnos.)

Balanic Epispadias.—Not more than three or four cases of this form have been reported. The penis is fairly well formed, but is short and spread out. The glans is usually solid with a furrow on the upper surface, or it may be divided into two halves.

Penile Epispadias.—The opening is in the upper surface of the organ usually just in front of the symphysis; the prepuce forms a thick fold; the skin of the abdominal wall is in contact with the glans and also with the scrotum. The penis is one to two inches long and curved upward. On its upper surface is a broad groove, extending from the glans to its base, or it may extend to the apex of the glans, or it may end but a short distance behind it. The groove of the organ has well-rounded edges and is lined with mucous membrane. The groove ends just in front of the symphysis in a deep funnel-shaped opening, partly covered by a fold of the abdominal wall.

The glans lies in the depression between the separated ends of the symphysis. Any part of the normal urethra remaining is generally of good caliber. In the cases observed, the prostate has sometimes been absent. The posterior portions of the corpora cavernosa were well developed, although but little corpus spongiosum was found, the bulb of which was small.

Etiology.—It is probable that the cause of epispadias is the same as that of hypospadias, that is, that it is due to a rupture of the urethra *in utero* on account of urinary retention owing to the absence or tardy formation of the balanic urethra. The rupture of the distended part of the urinary tract above the obstruction occurs when the abdominal envelopes of the fetus have not perfectly developed, with the result that there may be a separation of its wall in front, of a greater or less extent, as shown in epispadias or epispadias associated with exstrophy of the bladder. The weakest portion of the canal behind the obstruction is the part that gives way, which is usually the lower portion, thus accounting for the greater frequency of hypospadias. There are a number of points that have not been clearly explained in connection with this deformity, that belong to embryology rather than to urology. It may be said that the explanation given for the pubes not uniting is the presence of a distended bladder; and that the splitting of the organ depends on the separation of the symphysis, the division of the corpora cavernosa, the cicatricial contraction following the rupture of the urethra and the infiltration and breaking down of the surrounding tissues.

Symptoms.—The principal symptoms of epispadias, as in hypospadias, are those referring to the urinary and sexual functions.

The disturbed urinary function is principally shown by a faulty stream and incontinence. The stream scatters and wets and stains the clothing, besides wetting the neighboring integument and giving rise to an eczematous condition. The incontinence is a still more troublesome symptom. This has not occurred in the few cases of balanic epispadias that have been reported; but in the penile cases it occurs generally and is due to the large caliber of the posterior urethra which prevents the sphincter from functionating normally. The absence of the prostate gland in some cases also weakens the bladder orifice. The patients can hold urine fairly well when lying on their backs, but turning is accompanied by spilling the urine.

The sexual function is better than would be expected, as there is sufficient power present, notwithstanding the deformity. Coitus is, however, not satisfactorily accomplished and impregnation is not possible.

Prognosis.—Not much of a result is obtained by operation except to diminish the amount of spattering of urine by covering over the canal. When successful operations are performed and the irritation is removed, the sphincter may hold the urine for an hour or two. It is not advisable in these cases to give a very encouraging prognosis.

Operative Treatment.—*Thiersch's operation* for epispadias is the best. It is divided into five stages. The first stage consists in making a perineal fistula for drainage. A metallic guide is passed through the epispadic opening

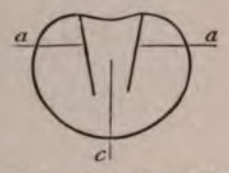



Fig. 683.—Thiersch's Operation for Epispadias. Showing the converging incisions in the glans, *a*. (Bryant.)

Fig. 683 *A*.—Thiersch's Operation for Epispadias. Freshening the surface, second step completed. (Bryant.)

Fig. 683 *B*.—Thiersch's Operation for Epispadias. Depression of middle portion with pin. (Bryant.)

and pressure is exerted on the perineum. A perineal section is then made, after which a retained catheter is passed into the bladder.

The second step of the operation should take place two weeks later. It consists in making a balanic urethra. Two converging incisions should be made in the glans, traversing three quarters of its thickness on either side of the balanic furrow, in such a direction that, if continued, they would meet on the under surface of the glans (Fig. 683). The glans should be denuded a little above the incision on either side (Fig. 683 *A*). The middle part is then depressed, and the two outer halves pulled over it and their denuded edges united. A small harelip pin is passed through the upper part of the glans to hold the approximated edges together assisted by a figure-of-eight suture (Fig. 683 *B*).

Fig. 684.—Thiersch's Operation for Epispadias. Marking out the flaps, *x* and *y*. *z* is the epispadic opening. (Bryant.)

Fig. 685.—Thiersch's Operation for Epispadias. Transverse section showing the formation of flaps, *x* and *y*. (Bryant.)

Fig. 686.—Thiersch's Operation for Epispadias. Transverse section showing flaps, *x* and *y*, made; drawing the flaps over. (Bryant.)

The third step, for the work of reconstruction of the urethra, can be begun after another period of two weeks. Two flaps are then made. The flap on the patient's right is made by an incision (*aa*) on the dorsal surface parallel to the furrow and close beside it, from the glans to the epispadic opening. From both ends of this longitudinal incision, a transverse one (*ab*) is made at right

angles to it (three eighths of an inch long), extending toward the side of the organ and forming the rectangular flap $x$. On the other side, three eighths of an inch from the furrow, another incision ($cc$) is made parallel with the one just described, and of the same length, from either end of which corresponding incisions ($cd$) are made at right angles to it, extending to the central furrow and forming the flap $y$ (Fig. 684). These flaps are then dissected up, taking the subcutaneous tissue as well to make them as thick as possible (Fig. 685). Flap $y$ is then turned over to the right, covering the furrow corresponding to the urethra and making its roof, and is sutured to the tissue on the other side of the furrow. Flap $x$ is then drawn over to the left in such a way that its raw surface comes in contact with that of flap $y$ (Fig. 686), and its free margin ($aa$) is sutured to the line of incision $cc$ (Fig. 687), thus completing the third stage.

The fourth stage of the operation is performed three weeks later, with the object of closing the opening between the recently constructed balanic and the

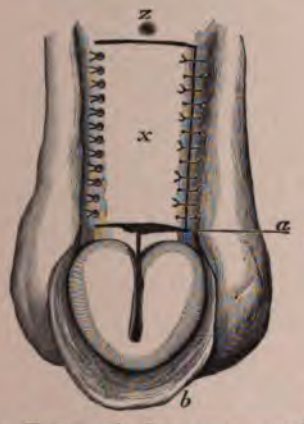



FIG. 687. — THIERSCH'S OPERATION FOR EPISPADIAS. Shows dorsal flap $x$ in place. Third stage completed. $z$ is the epispadic opening. (Bryant.)

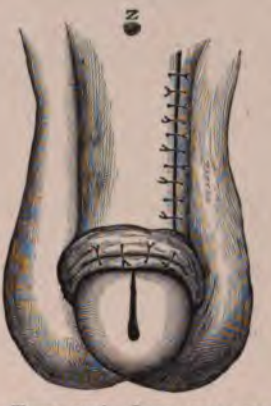



FIG. 688. — THIERSCH'S OPERATION FOR EPISPADIAS. Shows prepuce split and brought over glans to cover the gap. Fourth stage complete. $z$ is the epispadic opening. (Bryant.)

penile urethra. The prepuce ($b$) is stretched, raised up, and a slit or buttonhole made transversely through its ventral surface, after which the glans is passed through the opening. The tissues of the dorsum of the penis representing the gap are freshened and the raw surface of the prepuce, which may require the dissecting away of the mucous membrane, is brought over it and sutured there, thus closing the gap (Fig. 688) and finishing the fourth stage.

The fifth and last step is to close the epispadic opening. The tissues about it must be freshened, and a triangular flap ($b$) from over the left side of the pubes is brought down and over the opening and sutured to the transverse margin of the rectangular flaps (Fig. 689). A triangular flap ($a$) from the right side is then brought down over flap $b$, and sutured to it. In this way, the

two flaps from the suprapubic region make a flap of double thickness, covering the epispadic opening, with raw surface next to raw surface (Fig. 690).

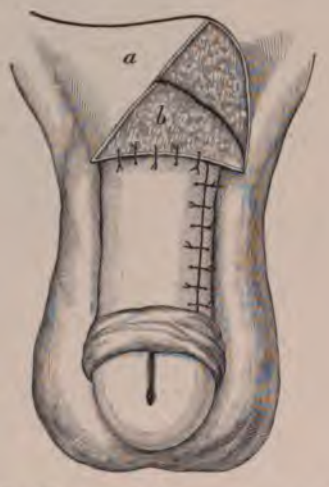



FIG. 689.—THIERSCH'S OPERATION FOR EPISPADIAS. Closure of fistulous opening, showing flaps *a* marked out; *b* turned down over the epispadic opening. (Bryant.)

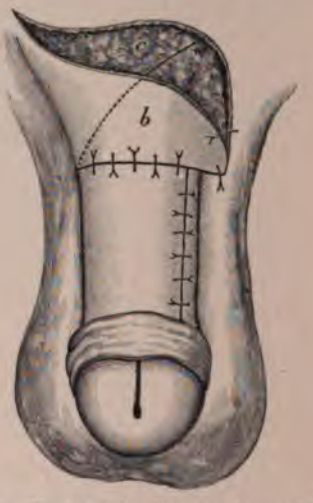



FIG. 690.—THIERSCH'S OPERATION FOR EPISPADIAS. Flaps united by bringing flap *a* over flap *b*. Last stage complete. (Bryant.)

It must not be thought that such an operation can be done in one sitting, and that, if it is not at once a success, it should be declared a failure, as Thiersch himself in the only case that he operated upon, worked one and a half years before considering the operation a success. Furthermore, he considers that it requires three or four months to operate such a case successfully.

# CHAPTER LV

## INJURIES OF THE URETHRA

INJURIES are of two varieties: First, those from without (*external*); second, those from within (*internal*). The wounds from without are generally the most dangerous; whereas those from within, although they often give rise to but slight trouble, are at times very serious.

We will first take up the consideration of the injuries from the outside, or external.

### EXTERNAL INJURIES OF THE URETHRA

External injuries are again classified according to the cause into (1) injuries that are inflicted by sharp instruments or weapons, as cuts or jabs, and (2) those that are caused by dull objects, through blows and falls.

(1) **External Wounds of the Urethra Inflicted by Sharp Instruments or Weapons.**—ETIOLOGY.—These are the results of jabs or cuts inflicted by bayonets, swords, knives, etc. The pendulous portion of the penile urethra is the part usually involved, the perineo-scrotal less frequently and the prostatic or membranous portion almost never.

PATHOLOGY.—When the urethra is wounded longitudinally, it is not much separated at the point of injury. There may be a slight narrowing as a result, but probably no permanent fistula. In the case of a transverse wound, it may be entirely severed, causing considerable separation of the two segments, in which case the urine will escape through the wound instead of through the distal portion of the canal. Fibrous tissues will form at this point, separating the two urethral segments, as a result of which there will be a urinary fistula above it.

SYMPTOMS.—The principal symptoms are hemorrhage and urinary disturbances.

The hemorrhage is usually slight, due to the cutting of the vessels of the urethral wall or the corpus spongiosum; but if the corpora cavernosa are much involved, it may be severe.

The urinary disturbances are the result of the urine escaping through the wound instead of the urethra beyond it. When blood clots accumulate, or an inflammatory swelling takes place in cases in which the urethral segments are

separated, there may be considerable difficulty in urinating, and retention of urine may take place. In the case of injury to the membranous or the prostatic portions, the blood may flow back into the bladder. The greatest danger in most cases cared for at the time is not from the immediate result of the injury, but from later complications resulting from the traumatic stricture.

TREATMENT.—Wash the wound clean with peroxid of hydrogen. If there are spurting arteries, ligate them. If the corpora cavernosa have been cut into, suture the sheath with chromic catgut. The edges of the urethra should be examined and, if the canal has been entirely severed by a transverse incision, its edges should be brought together and sutured. A retained catheter should be passed through the urethra in order to allow the canal to form anew about it, as well as to prevent urine from leaking into the tissues. If the canal has been but partly severed, the repair is also performed by suture. (See Operations for Partial Urethrectomy and Urethral Anastomosis.)

The question of drainage then presents itself. The retained catheter can be relied upon, in most cases, to carry the urine from the bladder past the wound, if it is carefully watched and not allowed to slip out. It is advisable to leave the tissues open down to the urethra for the sake of drainage, as closing them might result in urinary extravasation in case the urine escaped along the side of the catheter; or else an abscess might develop. This treatment applies to any part of the anterior urethra. If the wound is only in the pendulous portion of the penile urethra, the retained catheter may be dispensed with after repairing the canal, and a perineal section performed for drainage and to keep the urine from passing through the part of the canal operated upon.

In the case of a wound in the perineal portion of the urethra, in which the canal has not been entirely severed, after the hemorrhage has been stopped, a large perineal tube may be inserted into the bladder through this portion of the canal for drainage, and the urethra may be treated as any case of external perineal urethrotomy. The perineal opening, as well as the lower wall of the urethra, might even have to be slightly enlarged to allow the perineal tube to be passed. After a few days it would be advisable to remove the perineal tube in case there are no complications and to pass a urethral catheter to be retained.

In case of a wound of the membranous portion, it might be treated in the same way by urethral or perineal drainage. If the relations are lost as a result of the injury, a suprapubic cystotomy can be performed and a guide passed through the bladder into the urethra, followed by opening the canal in the perineum to a sufficient size for the introduction of a perineal drainage tube from below, or a urethral catheter to be retained may be passed through the entire urethra. If in any such case the urethra is injured, an attempt at repair should be made. (See pages 469 to 471.)

(2) **Outside Injuries to the Urethra by Dull Objects.**—These give rise to a contusion or a rupture, representing different degrees of injury. A contusion

can be a mild injury to the urethra, whereas a severe or extensive contusion may be associated with or give rise to a rupture of the canal.

Etiology.—The pendulous portion of the anterior urethra and the perineal bulbous portion are the ones principally involved. The predisposing causes in the pendulous portion are a state of erection, as the canal is then not so well covered as it is in the flaccid state; and an existing urethritis, on account of its lack of elasticity at such a time. The active causes are a blow from a projectile, from the foot, hand or stick, or catching the organ between two surfaces, as in closing a drawer or window.

The deep or perineo-bulbar portion is the most frequently injured by falls and blows, in the former case by the canal being crushed laterally between the impinging body and the pubes. According to Kaufmann, eighty-two per cent of

Fig. 691.—Injury in Front of Bulb just under Pubes, Caused by Fall on a Rail, Crushing the Urethra between the Rail and the Pubes. (Pousson.)

Fig. 692.—Injury to Urethra Caused by Fall on Plank, Crushing the Urethra against the Descending Ramus of the Pubes. (Pousson.)

these cases are due to falls, and eighteen per cent to blows. The majority of injuries from falls are due to falling astride a fence, a pole, bar, rail or branch; or the pommel of a saddle of a horse or bicycle. Of my own cases that I can recall offhand, one was due to a fall on the edge of a barrel, another on the pommel of a saddle, another on the bar of a bicycle, another across an object in falling on the deck of a vessel and another due to a fall from a car, in which case the man did not strike on the perineum, but on one side of his buttocks. In the last case, the patient had suffered from stricture for some time and the rupture was just behind it, due probably to transmitted force on the dilated and weakened portion of its wall.

In the case of injuries by blows, they are generally the result of a kick with the knee or the foot by a man or animal, or by some object like a stick propelled upward from below.

Ruptures of the membranous urethra are rare and may be the result of a blow behind the bulb; but often rupture of this portion of the urethra is due to an indirect cause, as a fracture of the pelvis (Fig. 693). In this case a piece of bone may pierce the urethra, or the canal may be caught between two fragments and crushed. The prostatic portion of the urethra will not be considered,

as it is almost never injured, and when it is, the cause is fracture of the pelvis or an injury from within. I have had three cases of rupture of the urethra due

FIG. 693.—RUPTURE OF THE MEMBRANOUS URETHRA, DUE TO FRACTURE OF PELVIS. (Pousson.)

FIG. 694.—FIRST GRADE OF RUPTURE OF URETHRA. Hematoma in corpus spongiosum.

to fracture of the pelvis, one due to a cart running over the pelvis, another to a crush in a mining accident, and another due to a fall. Prostatic injuries have been gone into extensively in the prostatic section.

FIG. 695.—SECOND GRADE OF RUPTURE OF URETHRA. Tear of urethral wall, urine leakage.

PATHOLOGY.—Injuries to the penile portion usually occur at the perineo-bulbar part. The contusion or rupture is generally transverse and limited to the inferior part of the wall. The corpus spongiosum is very often involved; but a complete fracture of the penis involving the corpora cavernosa is very rare.

In the perineo-bulbar portion there are three grades of ruptures. In the first variety, the areolar tissue between the trabeculæ of the corpus spongiosum is involved and is the seat of a hematoma (Fig. 694). This is really a simple contusion.

FIG. 696.—THIRD GRADE OF RUPTURE OF URETHRA. The same place as in Fig. 695, through corpus spongiosum and the deep layer of the superficial fascia.

FIG. 697.—THIRD GRADE OF RUPTURE OF THE URETHRA. Extravasation of blood and urine in scrotum, penis and lower abdomen.

In the second, there exists a tear of the urethra as well, with a urethral and periurethral hemorrhage, together with urinary infection of the hematoma in the corpus spongiosum (Fig. 695).

In the third variety, the fibrous coat of the corpus spongiosum and the layers of the superficial fascia are also torn, so that the blood and urine flow both into the urethra and into the perineal cellular tissue from the ruptured vessels in the corpus spongiosum (Fig. 696). There are thus in this third form two communicating spaces containing blood, one in the corpus spongiosum and the other in the space beneath the layers of the superficial fascia of the perineum that communicates with the scrotum, penis and inguinal regions (Fig. 697).

FIG. 698.—RUPTURE OF THE URETHRA, SHOWING EXTRAVASATION IN FRONT OF RECTUM.

Complete and incomplete rupture of the urethra simply means that the whole or only a part of the circumference of the canal has given way. Incomplete ruptures are the most common. The inferior wall is usually torn, while the upper wall remains intact. In complete rupture, the ends retract from one another for half an inch or more, so that it is almost impossible to find them in the crushed and lacerated tissues.

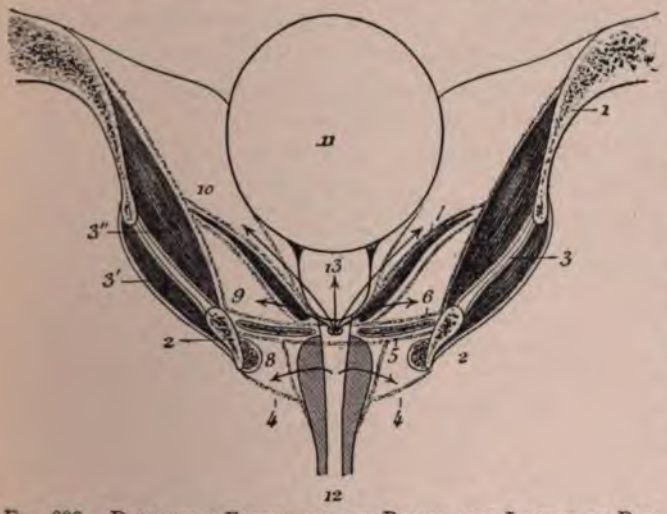



FIG. 699.—DIFFERENT FLOORS OF THE PELVIS AND LAYERS OF PELVIS FASCIA MARKING THE COMPARTMENTS INTO WHICH URINARY EXTRAVASATION TAKES PLACE.

*1*, Iliac bone.
*2*, Ischio-pubic ramus.
*3*, Obturator membrane with muscles on either side.
*4*, Superficial perineal fascia.
*5*, Inferior layer of triangular ligament.
*6*, Superior layer of the same.
*7*, Levator ani muscle.
*8*, Space into which urine escapes in wounds of perineal urethra in front of triangular ligament.
*9*, Ischio-rectal fossa.
*10*, Superior pelvic rectal space into which urine escapes when the membranous or prostatic urethra is ruptured.
*11*, Bladder.
*12*, Urethra.
*13*, Prostatic space.

In rupture of the membranous portion, due to fracture of the pelvis, there may be great displacement of the bony fragments, as well as separation of the ends of the urethral tear. Here the urine and blood may overflow into the pelvic tissues about the rectum (Fig. 698), into the perivesical space, into the ischio-rectal fossa, into the cellular tissue beneath the peritoneum or under the deep layer of the

superficial fascia, thus giving rise to communications between the different layers of pelvic tissue (Fig. 699), dependent upon tearing one or the other layer of the triangular ligament or other fascias. In one of my cases of rupture of the urethra, following pelvic fracture, the patient was passing all his urine through the left ischio-rectal fossa.

The corpora cavernosa may be injured in addition to the rupture of the urethra, the tear being either internal or open. They are sometimes badly injured and occasionally one of the roots or crura is torn from its attachment.

Symptoms.—The principal symptoms in rupture of the urethra are hemorrhage, pain, difficulty in urination, urinary retention, tumor and infection.

In rupture of the pendulous portion of the urethra, the symptoms are usually slight. There is generally but little urethral hemorrhage, a slight amount of pain and slight difficulty in urinating, besides a slight amount of thickening in the corpus spongiosum at the seat of injury, some ecchymosis of the skin, and usually but little or no periurethral suppuration. There may, however, be severe symptoms with abscess formation or urinary extravasation.

In rupture of the perineal portion, there may be but slight pain and hemorrhage, no difficulty in urination, a small tumor and no infection. Generally, however, the symptoms are more severe. The urethral hemorrhage is often quite marked and there may be a jet of red blood, or urine and blood, or the discharge of clots. Difficulty in urination in these severe cases usually causes the patient the first alarm, as sooner or later, when he attempts to void, he finds that either the urine is passed with difficulty in series of jets, or drop by drop, or not at all (retention). The obstruction is due to clots or urine about the urethra pressing upon the canal at the point of injury, which usually results in an abscess, or to a diffuse extravasation. Great pain and a feeling of pressure in the hypogastrium accompany the act of micturition.

Fig. 700.—Direction Taken by the Extravasating Urine. (After Hartman.)

If the leakage is rapid, due to an extensive injury, a diffuse extravasation of blood and urine rapidly develops. The patient feels the desire to urinate, due to his full bladder, and each time he attempts to do so he passes less urine through his urethra and more into his tissues; and, although he feels slightly relieved, he becomes alarmed as the swelling increases.

The symptoms of infection then show themselves. These are always grave in severe cases, but much less dangerous in mild ones. The infection is due to

some chronic suppurative disease of the urethra existing at the time of the accident, to pus in the urine coming from some suppurative condition above the seat of the injury or to the increased virulence of germs that exist normally in the urethra when they find themselves in the favorable soil of traumatism.

FIG. 701.—EXTERNAL APPEARANCE OF PATIENT SUFFERING FROM URINARY EXTRAVASATION. (Author's case.)

The large diffuse tumor containing blood, urine and infection quickly gives rise to a severe general sepsis. The extravasation extends under the deep layer of the superficial perineal fascia, and between its layers, and extends to the scrotum, penis, hypogastric region and groins (Fig. 700). If there is no surgical interference, the skin, which was white and shiny at first, rapidly becomes dark red in color and black spots and blisters appear upon it. The tissues then become gangrenous, gas develops in them and they sometimes crepitate on palpation. Fig. 701 shows the external appearance of one of my patients suffering from urinary extravasation. The patient generally dies of profound sepsis. Sometimes the scrotum and part of the perineum slough away, leaving the testes and cords bare, the urine and pus drain through the opening, and the patient recovers. Usually, however, cases of urinary extravasation die of sepsis if not operated upon promptly.

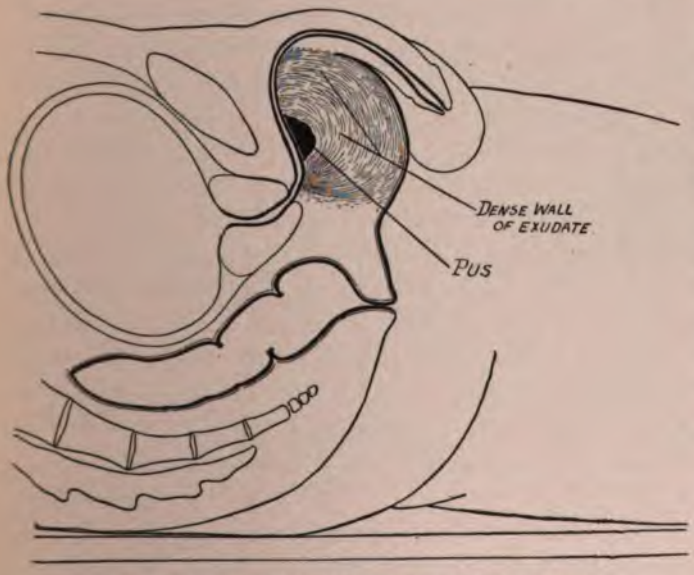



FIG. 702.—SLOW EXTRAVASATION. (Author's case.)

When the rent in the urethra is slight, the difficulty in urinating is less pronounced, and as but a small amount of urine leaks into the tissue with each act of micturition, it becomes walled off and a circumscribed tumor forms. This develops into a periurethral abscess, which is less dangerous, although the constitutional symptoms are often quite severe (Fig. 702).

The symptoms of rupture of the membranous portion are about the same as those of the bulbo-perineal portion, except that the extravasation is liable to extend to the space between the prostate and the rectum, to the ischio-rectal fossa, or to the cellular tissues of the pelvic cavity. The urethral hemorrhage is often absent, as, owing to the retraction of the two segments of the ruptured canal, the anterior urethra does not drain the ruptured region in which the blood and urine accumulate.

Diagnosis.—When there is a history of a fall on the perineum or a blow, followed by urethral hemorrhage, difficult urination, retention, with the development of a tumor in the perineum and a distended bladder, rupture of the urethra can be suspected. Very mild cases may be overlooked and it therefore behooves us to search for rupture of the urethra in every case with a history of a fall or blow in the perineum, or a fracture of the pelvis.

Rupture of the urethra must be differentiated from rupture of the bladder. In the former case, the bladder is felt to be dilated and there is urethral hemorrhage; whereas, in rupture of the bladder, no blood flows from the urethra and the bladder is not felt to be dilated, although there may be a diffuse thickening felt on bimanual palpation, due to the escape of urine into the prevesical space. If a catheter is introduced in a case of ruptured urethra, it may not go beyond the seat of the rupture, especially if the rupture is a complete one; but if it does enter the bladder, plenty of urine will be found present. In the case of a rupture of the bladder, it would pass through the canal into the vesical cavity, where only a small amount of bloody urine would be found. In rupture of the urethra, we usually have a perineal tumor and also well-defined suprapubic tumor due to a full bladder. In rupture of the bladder, there are no evidences of a well-defined dilated bladder, but either a diffused suprapubic distention owing to extraperitoneal urine, or general abdominal distention due to septic peritonitis.

Prognosis.—The dangers of rupture of the urethra are fatal hemorrhage, which is possible but improbable; retention of urine and uremia, also very infrequent; and death from sepsis, due to urinary extravasation, which is the greatest danger. The late dangers are changes in the bladder and kidneys, due to traumatic stricture.

Rupture of the pendulous portion of the urethra is usually attended by little danger, as a perineal section can be performed and the urine switched away from the seat of injury. Ruptures of the perineo-bulbar portion are more dangerous, while those of the membranous part are still more so. Kaufmann states that the general mortality without pelvic fracture is $14\frac{3}{10}$ per cent, but

when attended by fracture of the pelvis, it is $41\frac{7}{10}$ per cent. Prompt up-to-date surgical operations, applied as soon as the diagnosis has been made, will reduce the mortality in these cases considerably.

TREATMENT.—*Nonoperative Treatment.*—In slight injuries in the pendulous and bulbo-perineal portions of the urethra, in which no alarming local symptoms and no septic constitutional symptoms are present, the treatment can be symptomatic: Rest, a hot sitz bath, plenty of water internally, a urinary antiseptic, such as urotropin or salol. It is also advisable to insert a soft-rubber catheter to be retained for a few days. If a stricture follows, it can be dilated later on after the local lesions have healed.

In cases in which the symptoms are moderately severe or serious, the same treatment can be tried, but should be changed to more radical measures if danger threatens. The question of the treatment of cases with urinary retention is, however, the one that requires the greatest amount of judgment. Here rest, hot sitz baths and morphin injections which tend to diminish a possible spasm of the vesical sphincter or the cut-off muscle should be employed the same as in retention in other cases. If the patient begins to pass a small amount of urine in drops or in a fine stream, with frequency, this treatment should be continued in case there is no sign of a tumor developing in the perineum, or of sepsis; but if, on the other hand, it fails to induce free urination and a catheter cannot be passed and sepsis begins, or if a well-defined tumor or extravasation of urine develops, then an operation is imperative and the case is an emergency one. One patient sent to my service in the City Hospital with a well-marked extravasation of a deep red color with a dark mottling just appearing on the surface was told that unless operated on, he would surely die in twenty-four hours, replied that he would rather die than be operated on. He sank into a profound septic condition and died on the following day (Fig. 703).

FIG. 703.—CASE OF URINARY EXTRAVASATION THAT DIED IN TWENTY-FOUR HOURS. (Author's case.)

*Operative Treatment.*—Symptoms of extravasation of urine or of sepsis make the case an emergency one, and an operation should be performed at once, consisting of a perineal incision, opening the urethra or enlarging the opening longitudinally at the seat of the rupture, and inserting a perineal drainage

tube into the bladder. All pockets of clots, pus and urine should be incised an evacuated; besides which, all extensions of the extravasation into the scrotu penis or hypogastrium should be i cised and drained (Fig. 704). Tl bladder and the urethra should l washed clear and flushed with solution of permanganate of potas and all the pockets that have bee emptied should also be flushed o with permanganate solution ar packed. Sometimes the urethra ca not be found on account of the sep ration of fragments and the lar amount of extravasation. In th case, the perineal wound can be le open and the urine permitted drain through its tissues; or a supr pubic incision made into the bla der, a metallic guide passed dow through the bladder into the perine urethra and a perineal urethrotomy performed and drainage from the bladd through the perineum established.

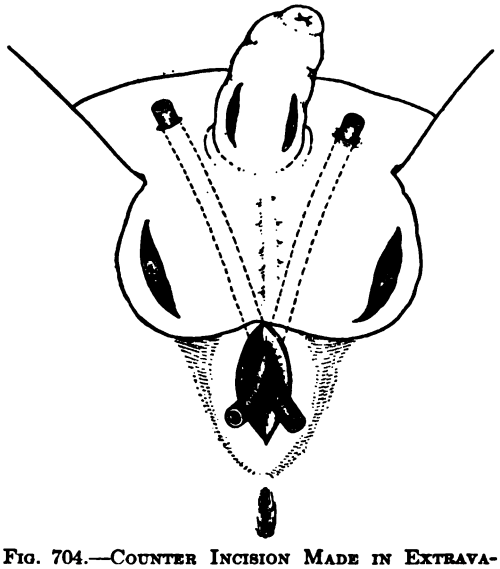


FIG. 704.—COUNTER INCISION MADE IN EXTRAVASATION.

In case a circumscribed abscess has formed in the perineum, it should l opened in the median line and the incision continued into the perineal urethr after which a perineal tube should be passed through the perineal opening in the bladder. Even if the circumscribed tumor is on one side of the perineu the incision should be made in the median line and the abscess drained into tl central incision.

## INTERNAL INJURIES OF THE URETHRA

The internal injuries of the urethra are usually not as severe as the extern and therefore not as important.

**Etiology.**—The predisposing causes of injuries of the urethra from with are stricture, calculi, dilatations of the canal, foreign bodies, chronic inflamm tion of the urethral glands and urethral ulcerations. The active causes are tl passing of instruments. The instruments passed in these cases are sound dilators and metal, glass and woven catheters.

**Symptoms.**—The symptoms of these cases are similar to those of ruptu from external causes, although they are usually less severe. In mild case there is simply some urethral hemorrhage. In other cases, there is son thickening about the area of injury, with perhaps an abscess formatio

whereas, in the more severe cases, there is the extravasation of urine already described. One of the most extensive cases of urinary extravasation that I have ever seen resulted from the passing of sounds for the relief of stricture.

Sometimes in performing an internal urethrotomy, when there is too great a dilatation of the urethrotome at the time that the incision is made, the knife cuts too far into the tissue between the corpora cavernosa and considerable bleeding follows the operation. In this case, dorsal curvature of the organ may result during erection. This usually disappears in time, although it may be permanent.

The symptoms in cases of internal injuries of the urethra, while resembling closely those of external injuries, are in a way more akin to periurethral inflammation (periurethritis) and I will refer the reader to the chapter on this subject for a further discussion.

**Treatment.**—This is the same as that of injuries due to external causes. There is never complete rupture of the urethra and consequently one of the most serious types of injury is avoided.

## RESULTS OF EXTERNAL AND INTERNAL INJURIES ACCOMPANIED BY URINARY EXTRAVASATION

I have had eighteen cases of rupture of the urethra that were associated with extravasation of urine; in addition to which I have had two cases in which an extravasation started after a perineal section for deep stricture, due to sewing the perineal tissues too tightly about the perineal tube. Besides these, I have had numerous others that were associated with hemorrhage and perineal abscess due to the passing of instruments for the purpose of treatment, which I will not mention.

Of the 18 cases,

3 were due to fracture of the pelvis.
9 were due to external injuries, falls (contusions).
1 was due to external injury, sharp.
5 were due to internal injuries.

Among the cases of external injury due to contusions (falls), including 3 cases of fracture of the pelvis, making 12 in all, there were 2 deaths, that is, $16\frac{2}{3}$ per cent. Of these two, one had a gangrenous perineum and was so septic at the time of the operation that there was but little hope. One of the other cases had a narrow escape, as the tissues of his scrotum and part of his perineum sloughed away, freeing the extravasation and leaving his testes exposed. A new scrotum was made for him from flaps taken from his thighs and groins. (See chapter on Diseases of the Scrotum.)

FIG. 705.—CASE OF TRAUMATIC ELEPHANTIASIS FOLLOWING EXTRAVASATION.

Of the five cases due to internal injury, one was accompanied by a very extensive extravasation and was profoundly septic; but this sepsis gradually diminished after multiple incisions for drainage. He had a traumatic elephantiasis of the penis following this, for a number of years (Fig. 705), besides numerous fistulas, one six inches long. The elephantiasis has now subsided, and he has but one fistula.

Whereas traumatism from within, due especially to the passing of instruments in cases of stricture and chronic involvement of the periurethral glands, may give rise to frequent abscesses and extravasation of urine, there are also other results of less importance, such as false passages, that I will now consider.

## FALSE PASSAGES DUE TO TRAUMATISM FROM WITHIN

**Etiology.**—A false passage is an injury to the urethral wall caused by the passage of urethral instruments when certain pathological conditions are present that predispose to such an injury. Small bougies and sounds pushed with force, when the physician does not hold the canal sufficiently extended, are the foremost of these causes. Catheters may catch in a crypt of Morgagni of the normal urethra; at the curve of the penoscrotal angle in some fold of the mucous membrane; or in the floor of the bulbous portion of the canal. This last condition is the most frequent and occurs when the bulbous portion of the canal is dilated so that the physician, in endeavoring to pass the instrument through the membranous urethra, may push the bulb back beneath the membranous portion, when a spasm of the cut-off muscle is present. Such a dilated and atonic bulbous urethra is most frequent in old men. In the prostatic portion, the tip of the instrument may catch in the posterior wall of a glandular orifice, or in the veru montanum or utricle.

In pathological canals, instruments may catch and form false passages in front of strictures of the anterior urethra; between the layers of the triangular ligament; in the adenomatous projections or crowded lateral lobes of hyper-

rophied prostates; in the irregularities or depressions in the general contour of rostates; or in cavities that are the result of prostatic abscesses in patients suffering from tuberculosis and gonorrheal prostatitis.

**Varieties.**—False passages are complete or incomplete. They are incomplete hen they enter the mucous tissue but a short distance, and complete when hey leave the canal and then return to it farther on, thus forming a tunnel utside of the urethra. Complete false passages or tunnels may also extend rom the urethra into the bladder, and usually form in the prostatic portion, as is more friable.

The incomplete passages frequently develop in the posterior part of the floor f the bulbous portion of the urethra, in which case the tip of a sound can frequently be felt through the perineum close to the finger.

**Symptoms.** — Hemorrhage is rarely serious or prolonged. Urination s accompanied by some smarting. There may be retention for a short eriod, perhaps intermittent, depending on blood clots, swelling, pasm and irregularities of the round. Extravasation of urine s rare.

Fig. 706.—Location of False Passages or Pockets in the Posterior Urethra. *1*, Intrabulbar; *2*, retro-prostatic; *3*, retro-pubic; *4*, trans-prostatic. (From Pousson.)

**Diagnosis.** — Hemorrhage following instrumentation. A small ougie à boule with a suitable curve assed into the urethra will generally enter the seat of injury and, case it is in the bulbous or rostatic urethra, it can be felt through the rectum. The opening can often seen with the urethroscope.

**Treatment.**—In case an injury takes place in passing instruments, which ay be the forerunner of a urethral passage, pass a catheter into the bladder, ash it out and then the urethra as well, from behind forward. The same ould be done when a passage already formed has been injured. In either se the catheter should be retained in case it enters the bladder with difficulty.

In stricture cases with retention, hot baths, morphin, antiseptics and rest are dicated.

In case the retention is not relieved and symptoms of extravasation develop, external urethrotomy should be immediately performed. These cases are ot often serious.

## URETHRAL POUCHES

(*Acquired Dilatations*)

These are pouches formed in the urethra, due to acquired dilatations of its walls, which should not be confounded with congenital dilatations, nor with the

false passages just considered. They occur in both men and women and are very rare.

**Etiology.**—In men, the dilatation occurs behind an obstruction, generally a stricture of a foreign body. The perineal portion is the most common location even when the obstruction is in the pendulous portion of the urethra as far as the meatus.

**Symptoms.**—The pouch fills when the individual urinates, forming a fluid tumor. These are said to be so large as to be sometimes mistaken for a hydrocele, when occupying the scrotal portion of the canal. When the act is finished, the urine continues to dribble out unless pressed out with the fingers. The semen at the time of coitus may empty into it, instead of being ejaculated from the canal. I have never seen pouches of very large size and consider them pathological rarities.

**Treatment.**—Removal of the obstruction, stones by forceps or incision and stricture by urethrotomy, after which the pouch may contract down again and regain its elasticity. When the pouch persists, an excision of a part of the urethral wall is indicated.

## URINARY POUCHES IN WOMEN

In women, the dilatation of the inferior wall of the urethra forms a vaginal urethrocele.

**Etiology.**—This condition may follow traumatism from falls or kicks. Childbirth may also so devitalize the tissues as to allow the canal to dilate at the point of injury.

**Pathology.**—The pouch when filled, resembles a thin-walled cyst, lobular in character, containing a transparent fluid and emptying into the urethra. When collapsed, it resembles a thickening of the vaginal wall.

**Symptoms.**—Usually there is a slight dysuria, also some dribbling from the cyst after urination. In more marked cases, there may be pain, retention and incontinence. The pain, when present, may be mild or severe in character, worse at the end of micturition. It is sometimes so violent as to cause faintness or fainting.

# CHAPTER LVI

## CALCULUS AND OTHER FOREIGN BODIES IN THE URETHRA

### URETHRAL CALCULUS

**Etiology.**—As I look back over the cases of urethral calculus that I have had during my last twenty years of active surgical work, I find that it has occurred principally in young men between the ages of twenty and thirty years. The ages of those under twenty were twelve, fifteen and nineteen, and two were over thirty, being aged respectively thirty-two and thirty-five.

My opinion regarding their origin is that they generally form in the kidney, pass through the ureter, remain for a varying time in the bladder and then pass into the urethra. The reason why they engage in the urethra is on account of a narrowing of the canal at some point behind which they lodge, this narrowing being either of a congenital or of an acquired nature.

I have never known of a calculus in a female, neither in my own practice nor in that of my colleagues, and consequently believe that such a condition is very rare. The reason of this is the shortness and large caliber of the female urethra. Burckardt found it to occur but twice in 1,840 female genito-urinary cases.

**Pathology.**—The composition of the calculus is similar to those that are found either in the kidney or bladder. A calculus formed in the kidney and passing down the ureter through the bladder and into the urethra is practically the same as a renal calculus (see chapter on Nephrolithiasis); whereas one remaining for a longer period in the bladder would resemble a vesical calculus (see chapter on this subject). After having remained in the urethra for some time, a calculus may increase in size and shape, due to the deposits of urinary salts, as well as to a change from a pure calculus to a mixed one, owing to the deposit upon it of some other variety of salts, principally those resulting from an inflammatory condition of the bladder. In the composition of the urethral calculi, phosphates predominate in both pure and mixed forms.

The size of the calculus varies from a small French pea to that of an almond. The principal seat is just behind the meatus or the fossa navicularis, due to congenital stricture at these points, next in the bulbous part, and lastly, in the prostatic portion. The calculus is generally not of a shape to block completely

the urethra. They are usually single, although in one case I found four in the pendulous portion of the anterior urethra (Fig. 707). In another instance there were three in the pendulous portion which when placed together made a large mass. I have had two cases of calculus in the bulbous urethra, a single stone in each case.

FIG. 707.—FOUR STONES IN THE PENDULOUS PORTION OF THE ANTERIOR URETHRA.

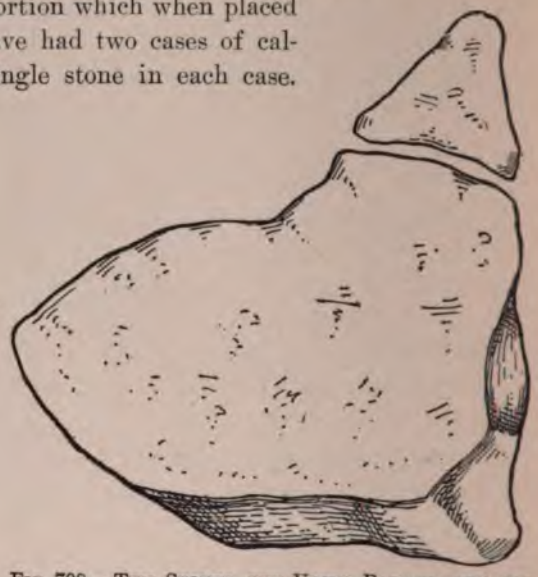


FIG. 708.—TWO STONES, THE UPPER POINTED INTO THE PERINEAL URETHRA, THE LOWER ONE SITUATED JUST BELOW IT AND PARTLY IN THE PERINEUM AND PARTLY IN THE RECTUM.

In one case I had five in the prostatic urethra. The canal is congested in the region of the calculus in recent formations, whereas, in cases of long standing, it may be chronically inflamed and thickened at the seat of the stone and dilated behind it. In one of the cases of stone in the bulbous urethra a perineal abscess resulted. In another case I had a very large stone partly in the perineum and partly in the rectum, with a smaller stone in the urethra (Figs. 708 and 709). (*Philadelphia Medical Journal,* November 25, 1899.)

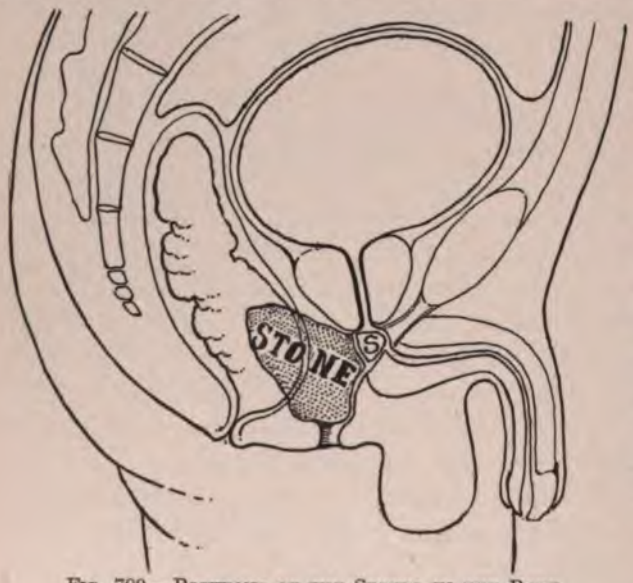



FIG. 709.—POSITIONS OF THE STONES IN THE BODY. Same stone as in Fig. 708.

**Symptoms.**—Retention of urine exists in cases in

which the canal is completely obstructed, but this is a rare condition and usually occurs in children. Difficult and frequent urination is present in some cases, while in others there is pain, burning and dribbling. The urine contains urethral epithelia, a few red blood cells and usually pus (if of long standing). In some cases, especially in the perineal urethra, a periurethral inflammation may take place, resulting in an abscess. Such an abscess, however, usually breaks down if not opened and is accompanied by all the symptoms of a periurethral abscess. If the abscess breaks or is incised and evacuated, a fistula will remain unless the stone is removed.

**Diagnosis.**—A metal instrument, sound or metal catheter, or stone searcher, inserted into the urethra, detects a hard substance and usually brings a metallic click. A bougie à boule also detects the calculus as well as any narrowing of the canal that may exist in front of it. The separation of the lips of the meatus shows the stone if it is just behind it; whereas it can be seen by a urethral speculum if near the end of the pendulous urethra, or by a urethroscope when deeper down. In children with a sudden attack of retention, a probe should be used. In the prostatic urethra a sound should be used, which must never be forgotten in palpating the urethra for a hard mass. Rectal examination will reveal a calculus as a hard, tender object and, in case there are two or more, distinct crepitus will be felt. In the case of recto-perineal stone above referred to, the stone was felt projecting into the rectum.

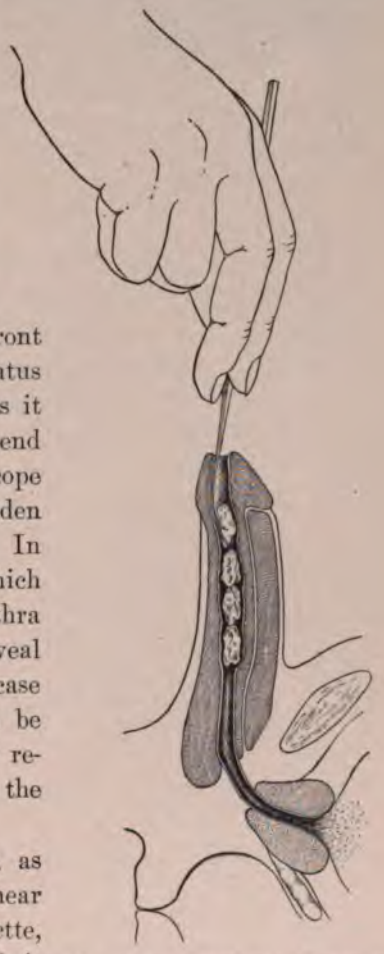


Fig. 710.—Urethral Curette Passed behind a Stone and in the Act of Withdrawing It.

**Treatment.**—The meatus, if small, is cut, as well as any congenital stricture between it near the fossa navicularis. A thin urethral curette, slightly bent, is passed down the canal until it is behind the calculus, when gentle traction is made and it is gradually drawn out (Fig. 710). If this is not successful, a pair of alligator forceps is inserted and the stone is grasped between its blades and removed (Fig. 711).

If the calculus is in the bulbous urethra and this method fails, a perineal urethrotomy should be performed and the stone removed by a curette or for-

ceps, aided perhaps by a sound in the urethra. Calculi in the middle portion of the pendulous section behind a stricture can often be pushed back sufficiently to allow the introduction of an Otis urethrotome and the cutting of the stricture; or else it can be pushed back and removed by perineal section (Fig. 712). In all attempts to remove calculi through the urethra, it is advisable to inject olive oil into the canal to soften and lubricate the tissues.

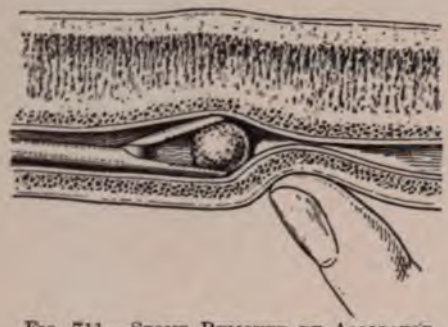


Fig. 711.—Stone Removed by Alligator Forceps.

A calculus in the prostatic urethra can usually be removed by performing a perineal urethrotomy, inserting the blades of a thin pair of forceps, grasping and withdrawing it; or else by pushing it back into the bladder by means of the forefinger introduced into the incision, stretching the prostatic urethra and removing the obstacle from the bladder by forceps; or by crushing it through the perineal incision and then removing the fragments. In the case of a large stone in the prostatic urethra that cannot be dislodged, it should be removed by a suprapubic cystotomy.

I have never as yet found a stone in the pendulous urethra in front of the bulbous portion that I could not remove by either introducing an instrument through the anterior urethra or through an incision in the perineal portion. I have also never failed to remove a stone from the bladder, which was movable and sufficiently small to enter the urethra, through a perineal urethral incision by means of forceps; consequently, if a stone in the prostatic urethra should be accidentally pushed into the bladder, it can easily be removed by forceps and does not have to be crushed. For the after-treatment of urethrolithotomy, see the chapter on Operations of the Urethra.

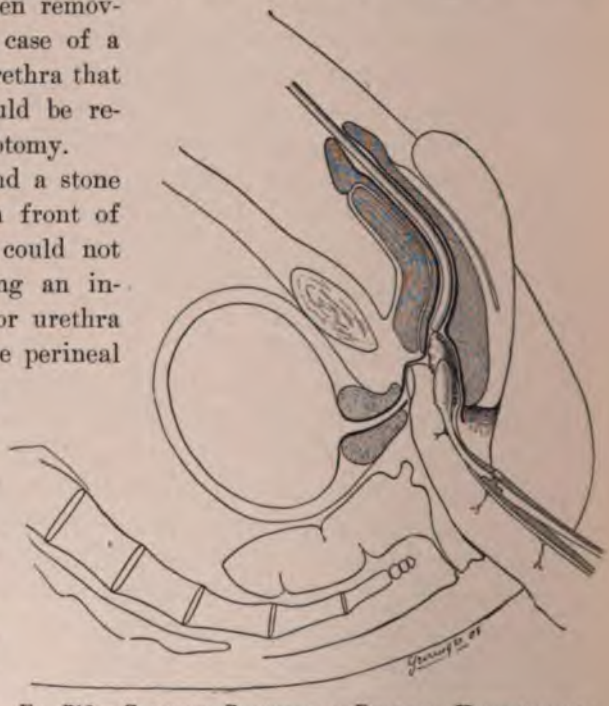


Fig. 712.—Calculus Removed by Perineal Urethrotomy.

Some recommend pushing a calculus of the posterior urethra back into the

bladder, crushing it and evacuating its fragments, litholapaxy. Personally, I prefer the removal of such calculi through a perineal urethrotomy incision.

As soon as the diagnosis of urethral calculus is made, it should be removed either by intraurethral means or through an external urethrotomy, as, if allowed to remain, it usually causes a periurethral abscess, a fistula or a cystitis with vesical and perhaps renal changes due to urinary obstruction.

### Urethral Calculus in Women

This is, as I have already stated, a very rare occurrence. When it does occur, it forms in a diverticulum of the urethra just behind the meatus. It gives rise to pain and difficulty in urination. Examination shows it to be a hard circumscribed swelling almost the size of a filbert or almond between the inferior urethral and the anterior vaginal walls. Pressure upon it sometimes produces a flow of pus into the urethra, as is shown by a urethral speculum. If the calculi are numerous, crepitus may be felt.

**Treatment.**—Sometimes these calculi in women can be removed through the urethra by enlarging the opening into the pouch where the concretion is by incising the tissues over it. Generally, however, they are removed by an incision through the anterior vaginal wall. After the removal, the sac or diverticulum should be dissected away to prevent the recurrence of calculus. The wound should then be closed and a catheter introduced through the urethra and retained.

## FOREIGN BODIES IN THE URETHRA

So far as I can remember, I have never had or seen a case of foreign body in the urethra, and as this experience is that of twenty-five years and among patients in both sexes in our largest hospitals and clinics suffering from urethral troubles, I must say that I consider the condition extremely rare. I have sometimes broken a needle in performing an external urethrotomy and on one occasion I failed to find one of the pieces, but fifteen years have passed since the operation and the patient has had a perfect cure and no symptoms pointing to any trouble resulting from the missing piece of needle which was evidently either flushed out at the time or has remained fixed in the perineal tissues. I have frequently left pieces of cotton in the urethra in doing endoscopy, but the patient has always passed them out during the first act of micturition.

The nearest approach that I have seen to a foreign body in the urethra was in a patient who came to the hospital in the service of my colleague, Dr. Walsh, saying that he had broken off a piece of catheter in the canal. A circumscribed thickening was felt over the place indicated, which was about two inches from the meatus, and obstruction was felt by the bougie à boule, although nothing movable could be detected. Dr. Walsh made a vertical incision through the urethra at this point, and disclosed a mass of thick scar tissue but no foreign

body. The urethra was sewed up again and a soft-rubber catheter passed through the urethra and retained. The wound healed in a few days and the catheter was removed. There were no complications.

This is instructive, both from the point of a foreign body in the urethra and a stricture, as it shows that a foreign body, if present, can be removed and the canal can heal when opened in this way. It further shows that a strictured portion of the canal at this point can also heal when thus incised from the outside, and in this case the obstruction was much less after the operation. My former experience in trying to heal external injuries of the anterior urethra made by sharp instruments had always led me to believe that an opening in the pendulous portion was most difficult to heal.

Foreign bodies enter the urethra through the meatus, through the urethral wall, or from the bladder. In the first instance, they are introduced for the purpose of sexual excitation, or in the instrumentation of the urethra for examination or treatment. Foreign bodies that enter from the outside are spiculæ of bone that are pushed through the wall in cases of fracture of the pelvis. Those entering the urethra from the bladder are objects that have penetrated the bladder from without. In the female, they may also be pushed in from the meatus; or else come down from the bladder in cases in which they have penetrated its wall by sloughing through from the vagina; or by having entered from the outside. Foreign bodies are not liable to remain long in the female urethra on account of its shortness and large caliber. The varieties of foreign bodies found in the urethra are: Pieces of surgical instruments, such as catheters, dilators, urethrotomes; pins; pencils; penholders; silk sutures and parasites from the bowels or kidneys.

The position of foreign bodies in the urethra depends on the shape and size. Small bodies usually lodge in the bulbous portion or in the fossa navicularis. Sharp bodies often puncture the urethral wall and hang from it at this point. Sometimes pieces of instruments broken off in the membranous or prostatic portion slip into the bladder instead of working their way down the urethra or remaining where they are broken off.

**Symptoms.**—The symptoms of foreign bodies in the urethra are similar to those of urethral calculus and the marked secondary changes in the wall of the canal may take several years as in the case of stone. Complete retention is mentioned as a symptom, but it would evidently be of very rare occurrence. The usual symptoms are those of irritation or inflammation, such as pain, burning or tingling during micturition or erection; pain or a dull ache increasing during micturition and radiating toward the glans; and muco-purulent discharge.

**Complications.**—The foreign body may become incrusted with urinary salts, forming a calculus. Other complications are: Urethritis, periurethritis and periurethral abscess resulting, perhaps, in fistula. Urinary infiltration is pos-

sible but not probable. Ascending infections as cystitis, pyelitis and pyelonephritis may occur as late complications.

**Diagnosis.**—The methods are exactly the same as in calculus, that is, by examination, as palpation on the outside of the urethra and per rectum; exploration of the canal by the bougie à boule, the urethroscope and, in certain cases, by the X-ray. In female cases the examination would be the same, except that the X-ray would not be used and a vaginal examination would be substituted for the rectal one.

**Treatment.**—The diagnosis of foreign body in the urethra having been made, its removal is called for. The first step is to inject oil forcibly into the urethra and to hold it there for a few minutes. If the foreign body is movable, an effort should be made to push it along the canal to the meatus and then withdraw it. If the meatus is small, it should be cut. If the foreign body can be seen by the urethral speculum, an effort should be made to seize and withdraw it by means of forceps or a urethral curette; if lower down, a urethroscope should be passed and an effort made to seize it with forceps. Any sharp body, as a pin that has been introduced through the meatus, can usually be withdrawn in this way; whereas, in coming from higher up, it either has to be pushed down until it has been loosened from the point where it has caught and then grasped and withdrawn by the forceps, or else a perineal urethrotomy should be performed and the foreign body withdrawn by this route with the forceps, the same as in urethral calculus.

It may be said that the treatment of a foreign body, not a stone, in the canal and that of urethral calculus are practically the same.

# CHAPTER LVII

## INFLAMMATION OF THE URETHRA

THIS includes, strictly speaking, any inflammation of the urethral canal due either to *gonococcal* or other infection, to *traumatism, foreign bodies, venereal sores* at the end of the canal or *tuberculosis.* Some of these have already been considered. *Gonococcal* and *nongonococcal urethritis* will now be discussed as the most important.

### ACUTE URETHRITIS OF GONOCOCCAL ORIGIN

This is an infectious disease of the genital or genital and urinary tract due to gonococcus infection. In this country it is usually spoken of as *specific urethritis* or by the Latin name of *gonorrhea,* whereas in Europe it is generally called by the Greek name of *blennorrhagia.*

Some of the older writers did not distinguish it from other strictly venereal affections, such as syphilis and chancroids. Heated discussions as to whether or not gonorrhea and syphilis were forms of the same disease continued during the eighteenth and nineteenth centuries, until Ricord finally made the distinction between the two affections. Eventually the specific germ of gonorrhea was discovered by Neisser, of Breslau, in 1879, to be the gonococcus, since when it has been proved to be the cause of most cases of urethritis.

**Statistics.**—The frequency of gonococcal urethritis cannot be accurately estimated for the reason that a large percentage of the cases never consult a physician, as they consider it simply a slight ailment. Men often pay but little attention to the trouble and allow it to run its course, using whatever their friends and the druggist prescribe, while many women have it without realizing that they are suffering from an infectious disease. The Statistics of the Genito-Urinary Clinic at Breslau show 3,465 cases in 29,386 patients who applied for treatment, while Neisser says that forty per cent of all public women in Breslau are constantly affected. It is said that, in the European universities, from seven to eight per cent of the students are affected in the course of the year, and in the European armies the percentage is thirty-two per cent. It is also thought that the majority of men in large cities have had at least one attack.

**Etiology.**—The disease is most common in young men between the ages of twenty and thirty. It is more often found in men than women, as the infection in the female often affects only the genital tract.

Predisposing causes are a large meatus, hypospadias, sexual or alcoholic excesses, while former attacks make the patient more liable to new infections. Some individuals are markedly predisposed, while others seem to be immune.

The exciting cause of gonorrhea is infection by the gonococcus during coitus. Fournier's table of the classes of women who infected 387 men under his care were as follows:

| | | |
|---|---|---|
| Licensed prostitutes ..... | 12 | cases |
| Private prostitutes ..... | 44 | " |
| Mistresses and actresses ..... | 138 | " |
| Working women ..... | 126 | " |
| Servants ..... | 41 | " |
| Married women ..... | 26 | " |

It will thus be seen that licensed prostitutes are safer than any other impure women for men who are in the habit of indulging in illicit coitus, and, as the same applies to syphilitic infections, it will be apparent how important it should be to license prostitution.

Fig. 713.—March of the Gonococcus in the Male.

**The March of the Gonococcus.**—After gonococci have gained access to the part of the mucous membrane of the urethra, just within the meatus and in the fossa navicularis, they adhere to its mucous surface, increase in number and spread over it. They then penetrate between the epithelial cells of the superficial layers in single rows or larger masses. They invade the openings of the crypts of Morgagni, urethral follicles and glands of Littré and, although they are essentially germs of the mucous membrane, they are sometimes found in the deeper structures, even in the connective tissue. Outside of the urethra they attack the mucosa of the conjunctiva, of the rectum, and have also been found in the mouth and nose. They are also found in the bladder, the pelvis of the kidney and the kidney proper, and are common in the prostate gland, seminal vesicles and epididymis. The frequency with which they are encountered in Cowper's glands is questionable; although they are often found in the corresponding glands of the female—those of

Bartholini. In women they invade the uterus, the tubes, the ovaries and the peritoneum. They are also found in the endocardium, pericardium and other serous cavities, as well as the joints, spinal cord and brain coverings in both sexes. The gonococcus is a most persistent germ, especially when it has affected the mucous membrane, whereas it disappears quite promptly from the internal organs and joints. When dried it does not live over five minutes.

The gonococci are thought to remain latent for years in the follicles of the urethra and prostate, and to become active under favorable conditions. They have been discovered as late as ten years after the primary attack in relapsing cases. When lodged in the urethra permanently, they lose their virulence unless some predisposing cause arouses their activity. During this period of seclusion, one cannot say that they are present, unless an exacerbation takes place.

**Pathology.**—A satisfactory study of the pathology of acute gonorrheal urethritis is unfortunately difficult on account of the lack of autopsy material. In acute gonorrheal urethritis, the invasion of the urethra by this diplococcus is followed by a period of incubation, during which the germ multiplies and penetrates the deeper layers; congestion takes place; a large number of leucocytes emigrate from the dilated blood vessels and become hosts of the gonococci. The process of phagocytosis (the stage of suppuration) is thus quickly reached and there is a discharge of pus and epithelia. The mucous membrane is infiltrated and contains a large number of connective-tissue cells. Over some areas the epithelial layer is thrown off and the walls of the canal become thickened and deeply injected, causing a loss of smoothness and elasticity. The mucous membrane of the glandular structures of the canal is thickened and in a state of epithelial proliferation. Later, the ducts of the glands may be blocked and the glands obliterated, or they may be converted into small cysts. Sometimes the inflammation extends to the tissues of the corpus spongiosum, especially in the region of the glans. The lymphatics of the organ may be inflamed, as well as the inguinal glands. The latter when affected are but slightly enlarged and rarely suppurate.

The extent of the process varies according to the virulence of the affection and the resistance of the patient. It extends backward and upward and shortly involves the entire anterior urethra. It may be limited to this part of the canal, but it usually extends to the posterior urethra, from which point it may spread to the prostate, the seminal vesicles or along the vas to the epididymis. The posterior urethra is involved in ninety per cent of the cases. The stage of decline begins in from one to two weeks and is characterized by the gradual disappearance of the congestion and the discharge. The gonococci diminish in a marked degree.

**Bacteriology of the Gonococcus.**—The gonococcus of Neisser is a diplococcus measuring from 0.8 to 1.6 microns in length and from 0.6 to 0.8 in width. Owing to a peculiarity in its method of division, it usually occurs in

pairs, each half resembling a kidney, or bean, in shape and the pair having the appearance of a French roll. Between the pair is a bright line or slit, their flattened surfaces facing each other. When this diplococcus multiplies, it is divided by a transverse line at right angles to the line separating the two members of the pair, and thus four cocci are grouped in two pairs. This arrangement is characteristic of the gonococcus, which almost always occurs in pairs, in fours, or multiples of these numbers.

The gonococcus in the pus of an acute infection is found within the protoplasm of the pus cells (*intracellular gonococci*), in some cases filling the entire cell, but in no case invading the nucleus. As the pus cells rupture, apparently after being overfilled with multiplying gonococci, some of these germs will be found floating free in the fluid portions of the pus (*extracellular gonococci*). Others will be found adhering to the epithelia from the urethra which are found in the discharge.

The gonococcus stains readily with aniline dyes and is decolorized by Gram's method. The above are the chief characteristics of the gonococcus. The details of the staining and cultivation have been given elsewhere, in the chapter on Discharges and also in the chapter on The Urine under Bacteriology.

**Symptoms.**—The symptoms of acute urethritis depend on the virulence of the infection.

Period of Incubation.—The period of incubation is from three to seven days, although it may vary from two days to three weeks. During the prodromal stage, there may be a slight burning on urination and there is usually an itching sensation, with perhaps some reddening about the meatus. A slight viscid discharge, at first scanty and of a grayish color, is generally noticed, which consists of mucus and pavement epithelia, usually with gonococci and perhaps a few pus cells. The urine at this stage is usually clear, with pin-point shreds.

Active Period.—The active period of acute urethritis commonly begins with the development of pus in the discharge. The discharge is the most important symptom for consideration, as it varies in quantity and character according to the severity of the attack, and by observing and examining it we are best able to judge of the course of the disease. It varies in quantity and color from a slight leakage of a thin gray, or yellow-gray, color to a profuse yellow-green discharge, perhaps tinged with blood. The discharge, if examined microscopically, during this stage shows an increase of pus which covers the greater part of the field of vision, while the epithelia have become more scant in proportion. The gonococci are numerous and contained in the pus cells (intracellular). As the disease progresses toward its end, the pus and gonococci diminish and the epithelia and mucus again become more prominent.

The reddening of the meatus, glans and prepuce occurs in varying degrees. In moderately acute cases, the glans may simply have a circle of redness about

the meatus, while, in hyperacute cases, it may be red and turgid in its entirety. The prepuce is often swollen and red, sometimes to such a degree that phimosis or paraphimosis occurs. In subacute cases there may be no redness about the meatus.

*The dorsal lymphatics* of the penis vary much in their appearance. There is generally no sign of their involvement, while at other times they are slightly enlarged and tender and the skin over them may be reddened. Sometimes the lymphatics are very much involved, in which case the penis may also be enlarged and edematous, and the skin have a pinkish hue. An inflammation of the cellular tissue (cellulitis) sometimes takes place, resulting in suppuration.

*The lymphatic glands* in the groin are frequently enlarged and tender in urethritis, often appearing as a small mass on either side, called a *bubo*. They are quite tender to the touch, but the extent of their involvement does not depend upon the amount of penile lymphangitis, as they may not be enlarged when there is a marked lymphangitis of the organ, while on the other hand they may be enlarged and tender when the dorsal lymphatics are apparently not involved. Suppuration of a gonorrheal bubo has been rare in my experience.

*Painful erection* (chordee) occurs in many cases. It is due to an edematous infiltration into the corpus spongiosum which loses its elasticity and consequently does not stretch to the same degree during erection as the distended and extended cavernous bodies, the result of which is that the corpora cavernosa are bowed and there is a bending of the organ accompanied by pain.

*Urination* is also disturbed and is sometimes painful to a marked degree, although cases in which there are redness and edema and a very profuse discharge may be absolutely free from pain. At times the pain is so acute that the patient suffers greatly when voiding and clenches his hands and bites upon some substance in an effort to produce in this way some peculiar anodyne effect. The pain in these cases is due to the sudden stretching of the swollen mucous membrane and also of the corpus spongiosum which is infiltrated and resisting.

*The appearance of the urine* in urethritis depends upon the acuteness and locality of the inflammation. When the discharge increases, as it does at the beginning of the active stage, the urine, which has been clear with some mucus and pin-point shreds, quickly becomes turbid, due to the pus present, and continues so until the stage of decline. If the urine is allowed to settle in a tube the pus will form a thick deposit at the bottom. As the discharge lessens in the stage of decline, the deposit becomes thinner and the pus may appear in clumps. A mucous layer is seen above the pus as a nebulous cloud and as the pus diminishes the mucus increases and finally disappears with the discharge. When the discharge is about to stop the urine contains a few pin-point shreds that float about in it. In unfavorable cases, gleety shreds develop, containing pus and epithelia, the proportion of epithelia becoming greater and that of the

pus smaller as the case goes on to a cure. When the pus disappears, the patient can be considered cured. Shreds containing much pus sink rapidly, while those that contain but little tend to float.

THE STAGE OF DECLINE.—This stage occurs at about the end of the second or third week, when the inflammation and all the subjective symptoms gradually lessen. The edema subsides, the discharge contains less pus, and the color changes to yellowish gray or gray. In favorable cases the discharge stops in the fourth or fifth week, by which time the gonococci appear to have been entirely eliminated.

*Microscopical Examination of the Discharge.*—This shows the gonococci to be less numerous as the inflammation subsides, and the epithelial cells to be increasing in number, until the discharge consists of mucus and epithelial cells only.

The *urine,* in the early stages of the decline, if passed in two glasses, shows the first to be cloudy and the second clear; but, as the discharge lessens, the secretion becomes pressed together between the folds of the mucous membrane of the urethra, or else localized on certain areas along the canal as smears, from which points they are rolled up by the urine coming down the canal into shreds. The first specimen shows urethral shreds, which shreds are consequently the same histologically as the discharge.

These symptoms are present in a marked degree in a very acute case, whereas in milder cases they are not so severe and may even be absent.

SYMPTOMS ACCORDING TO SEVERITY.—As we see patients coming to the clinic and office, we cannot help noticing how severe some cases are and how mild are others. As I said before, this depends on the virulence of the infection, but I also think it depends on whether or not there is a predisposition on the part of the patient to pus formation.

I will, therefore, divide acute urethritis into three groups, depending on the severity of the symptoms, namely: (1) Hyperacute, (2) simple or moderately acute and (3) subacute. The simple or moderately acute will illustrate the ordinary acute cases that we see in practice. It is rather important, I think, to consider such a division from a symptomatic as well as from a therapeutic point of view, as it enables the reader to better judge of the cases and the treatment necessary.

(1) *Hyperacute urethritis* is sometimes spoken of as phlegmonous. The incubation and prodromal stages are short. The symptoms of the acute stage are intense, as shown by the yellow-green discharge, which may be perhaps tinged with blood. This shows on examination an enormous number of pus cells and gonococci and often red blood cells. The redness and edema of the prepuce and glans are most marked. The lymph vessels of the dorsum of the penis and the glands in the groin are large and tender, and the entire organ often swollen and pink. This sometimes goes on to the development of a cel-

lulitis known as *penitis*. There is intense pain on urination, the organ is very sensitive to the pressure of clothing, while the erections at night are very painful (severe chordee). The pain on urination is intense. The urine passed in two glasses shows the first part to be very cloudy and the second clear during the early part of the attack, but later, at the end of the first or second week, when posterior urethritis has developed, the second urine is also cloudy.

(2) The *simple or moderately acute form* of acute urethritis is the most frequent variety. It has an incubation period of from three to five days. The prodromal stage is from a day to a day and a half. The discharge is yellow and profuse, and examination shows it to be full of pus and gonococci, but not puro-sanguinous. The meatus is red and swollen and there is a zone of redness on the glans about the meatus extending back for half an inch or more. There is little or no edema of the penis and no notable inflammation of the dorsal lymphatics, although the inguinal glands may be slightly tender. Painful erections (chordee) are not so marked and may be absent. Urination is accompanied by burning, although the pain, if present, is slight. The urine contains pus, but is not so turbid as in the very acute form. The second urine is clear except when the posterior urethra is much involved.

(3) In the *subacute form* there is a small amount of discharge which is but slightly yellow—the so-called *muco-purulent*. There is no redness or edema of the glans or prepuce. The lymphatics of the dorsum and inguinal regions are not involved; chordee is not present. The first urine is slightly cloudy; the second clear. There is no pain and but little burning on urination. Notwithstanding the symptoms are mild and the disease usually of short duration, these subacute cases frequently become chronic and most obstinate.

Subacute urethritis may be so mild as not to have sufficient subjective symptoms to be noticed by the patient. In some of these cases there is slight burning on urination, but no discharge is noticed, while in other cases there is a slight moisture that does not concern the patient. (A platinum loop inserted into the urethra of patients with such poorly expressed types of disease would probably be able to obtain sufficient discharge to find the gonococcus.) In either of these two types, if the disease reaches the posterior urethra, there may be subjective symptoms that will bring the patient to the physician, and in either case the shreds may be found in the urine. Such very mild cases are, however, rare and may run a course of a few weeks or even months without the patient thinking that he has gonorrheal urethritis. The discharge in these cases is increased temporarily by alcoholic excesses.

**Diagnosis.**—The diagnosis of an acute gonorrheal urethritis is made by discovering the gonococci in the urethral discharge. When this is scanty, as in the beginning of an attack, repeated examinations are sometimes necessary. Nonspecific urethritis may be diagnosticated by a discharge in which no gonococci are found.

Differential Diagnosis.—*Syphilis.*—A chancre just within the meatus, if ulcerating, can immediately be differentiated from gonorrheal urethritis, as ulceration of the meatus never occurs in gonorrhea.

A nonulcerating initial lesion, either in the form of a simple induration, or an erosion, accompanied by a slight discharge, is more difficult to diagnosticate, as there is considerable exudate and stiffening of the meatus which prevents a good visual examination. The meatus is, however, felt to be more resisting and indurated. The microscopical examination of the discharge shows the absence of gonococci, and sometimes the spirocheta is found. Chancroid of the meatus is characterized by ulceration, and thus differs from acute urethritis, which never causes ulceration.

*Chronic urethritis* is differentiated from acute by the history of the duration of the disease and the mild character of its symptoms. When acute exacerbations of a chronic urethritis develop, as they often do through excesses in alcoholics and venery, exposure to inclement weather or too vigorous treatment, then the symptoms may be the same as in an acute attack; but it subsides more quickly and the acute exacerbations do not give rise to such acute subjective symptoms as very painful micturition and chordee. In acute exacerbations of a chronic urethritis the epithelial cells are more degenerated and the gonococci are less numerous and more attenuated.

*Nonspecific Urethritis.*—In the absence of any venereal sores, if a discharge is present, it is either a gonococcal or nongonococcal urethritis. An examination of the discharge will show which of these two forms it is. In nonspecific urethritis, the symptoms are usually less severe and subside quickly. Sometimes, in cases of mild, subacute specific urethritis, no gonococci are found in the discharge and it is supposed to be nonspecific. The disease continues and in a few days or after a longer period, gonococci are found. Such a prolonged absence of gonococci may occur in patients with a first infection and in one such case in my practice they were not found for three weeks, notwithstanding that frequent examinations were made.

**Prognosis.**—This should be guarded. Very acute cases are more liable to complications than are the moderate or subacute, as a result of which the case is prolonged. In a subacute case, the patient may regard his infection as a very slight ailment and the physician, to cheer him, often says that it is very mild and will be quickly cured; but such attacks frequently become chronic, in which case the patient may become dissatisfied with the physician's treatment. It is wiser to say, "I will try to cure you in three weeks, but it will depend on the progress of the disease and how you respond to treatment, and also on the care that you take of yourself. It may take six weeks or more and the longer an acute attack lasts the greater its tendency to become chronic." In my experience, a cure in three weeks is a very satisfactory result, a cure in six weeks is common and a cure in three months not uncommon, while patients taking the best of care of themselves often suffer for a much longer period.

### Acute Posterior Urethritis

This is a part of the general urethritis by extension of the process through the membranous urethra into that portion of the canal surrounded by the prostate, and it occurs, as has already been stated, in about ninety per cent of the cases.

The development of posterior urethritis usually occurs in the second week after the appearance of the discharge. The beginning cannot always be determined by the subjective symptoms, as they are not always marked even in acute cases, and may not be sufficient to be noticed by the patient; whereas in mild cases they are occasionally very severe. In other words, the symptoms often depend more on the susceptibility of the patient to pain and discomfort than on the amount of inflammation and pus.

**Etiology.**—Sexual excitement, alcoholics, exposure of the lower extremities to cold and dampness, the introduction of injections by force, all predispose to its development. Exercise is also said to be a predisposing cause. This may be true in men who do much athletic work, or ride horseback or the bicycle, or do hard laboring work. I find, however, that my patients who live their ordinary routine life and who abstain from alcohol and sexual excitement, who are well protected by clothing and who stay at home evenings, during an attack of urethritis, are less liable to annoying posterior urethral trouble than those who change their manner of living and suddenly remain quiet at home on a restricted diet and cut out all their exercise.

Some patients are predisposed to posterior urethritis and suffer from it with every attack of gonorrhea. Usually such patients have a narrow meatus or some stricture, acquired or congenital, along the canal.

**Symptoms.**—The symptoms are disturbance of urination, pain, tenesmus and hematuria.

The first symptom of posterior urethritis in acute cases is usually *frequency of urination.* In the majority of cases, the patients urinate from six to nine times a day and once at night. In cases in which the symptoms are severe, they will urinate every half hour during the day and four or five times at night. The desire to urinate is usually imperative and sometimes occurs precipitately, that is, before the patient has time to prepare for the act. Often at the end of micturition, he feels that he has not completely emptied his bladder and strains in an effort to pass more, but the bladder and the posterior urethra are probably empty and this sensation is due to the presence of a thickened and turgid mucous membrane.

*Pain, burning* and *tenesmus* accompany and follow the act of micturition in most of the severe cases.

*Hematuria,* known as terminal hematuria of posterior urethritis, sometimes occurs as a few drops of blood after urination in cases in which the inflamma-

tion of the posterior urethra and the tenesmus are very marked. A marked hematuria is exceedingly rare.

The urine in severe cases of posterior urethritis, if passed in two or three glasses, shows turbidity in each glass, the first specimen being more turbid than the second or last. The reason of this is because the discharge accumulating in the posterior urethra fills that portion of the canal and then overflows into the bladder and mixes with the urine. In mild cases, the first urine is turbid and the other specimens clear or but slightly cloudy.

While the inflammation is centered in the posterior urethra, the discharge from the meatus is diminished, only to increase again when the inflammation of the posterior urethra has subsided.

In the course of posterior urethritis, erections are frequent, but are less painful than in the acute anterior form. Nocturnal pollutions (wet dreams) are common and are sometimes accompanied by stabbing pains in the prostatic urethra due to the prostatic and ejaculatory ducts being involved or closed by the inflammatory exudates about their mouths.

*Constitutional symptoms,* such as fever, may be present and this, together with anorexia, constipation and insufficient sleep due to frequent urination, often debilitates the patient with surprising rapidity. Mental depression adds another distressing feature to the case.

Acute posterior urethritis is so frequently accompanied by or followed by acute prostatitis, that it is necessary in every case to examine the patient by rectum in order to determine the presence of this complication.

It is easy to notice, in reading the literature of the present day, that various data in the etiology, symptomatology and treatment of urinary troubles have been handed down from generation to generation which we know are not in accordance with our present findings. There is great confusion in the symptoms of posterior urethritis, prostatitis and vesiculitis, on account of their relations to one another; nevertheless, it behooves us to make as definite a distinction as possible between them in order that they may be better interpreted by our readers.

## CHRONIC GONOCOCCAL URETHRITIS OR GLEET

Chronic gonorrheal urethritis never occurs except as the sequel of the acute process. The degree of inflammation of the acute attack has no bearing on the chronic trouble, as many very acute cases never become chronic, while it frequently happens that the mildest attack will develop a most stubborn chronicity.

If the discharge continues after the sixth or eighth week of the disease, it can be regarded as chronic.

**Etiology.**—When an acute attack becomes chronic, it is generally due either to too vigorous treatment at first, to no treatment at all, or to the neglect of the

patient to lead the life prescribed by the physician. Early indulgence in alcohol and sexual excitement toward the end of an acute attack, predispose to the development of chronic urethritis. It is also more frequent in debilitated individuals, such as those suffering from alcoholism, nephritis, syphilis, malaria, diabetes and tuberculosis. Repeated attacks of urethritis of long standing, or with complications, also predispose to a chronic process in all following attacks. Natural impediments to the urinary flow, such as occur in congenital narrowing of the meatus, in front or behind the fossa navicularis, in hypospadias, or in stricture, are also predisposing causes to a chronic condition. An exhausting occupation is another predisposing factor.

Insufficient treatment of an acute attack is rarely due to the physician's neglect, but to the patient's indifference, either because he considers it a slight ailment or on account of his ignorance of the disagreeable and dangerous sequelæ that often follow. The longer a case lasts and the milder its symptoms become, the more difficult it becomes to keep the patient well in hand and the more liable he is to commit indiscretions and interrupt the treatment.

Physicians should in all cases impress upon a patient suffering from this trouble that he is not cured when the discharge has disappeared; but that as long as pus and gonococci are found in the urethra, in the urinary shreds and in the matter expressed from the prostate and seminal vesicles, treatment should be continued.

**Pathology.**—As my students seem to confuse urethral glands and follicles, I will introduce the following anatomical details for the sake of clearness:

*Follicles and Glands of the Urethra.*—Follicles of the urethra are small depressions or sacculations in the mucous membrane of the urethra, scattered throughout the canal. A number of minute closed follicles are regarded as rudimentary glands of Littré.

Crypts of Morgagni are larger sacculations situated usually on the upper wall of the spongy urethra, from twelve to twenty in number.

Littré's glands are the true glands of the urethra. One group, situated in the mucosa, is of simple structure. The larger glands, which are less widely distributed, are situated in the submucosa and some of them even between the trabeculæ of the spongy portion. One or several of these glands may empty into a crypt of Morgagni.

I have adhered as closely as I could consistently to Oberländer's description of glands and follicles, as his clinical teachings of the urethra are the most comprehensive and up to date.

The pathologies of the acute and chronic processes are quite distinct, and yet the two stages merge so imperceptibly from one to the other that an exact line of demarcation cannot be drawn. A chronic urethritis is practically an uncured acute attack which has become localized in certain portions of the canal.

Oberländer distinguished two principal changes in chronic urethritis, a soft infiltration and a hard infiltration.

*Soft infiltration* is the first stage of the chronic form. There are localized foci of round-cell infiltration, chiefly about the urethral glands, the forerunner of a connective-tissue change. A catarrhal condition is present over these areas which are much congested, and the epithelium is somewhat desquamated. The urethral follicles and crypts of Morgagni may also show evidences of inflammation.

*Hard infiltration* is the second stage. Connective-tissue formation has taken the place of round-cell infiltration in the body of the glands and about the ducts. The walls of the canal are harder in places, due to the presence of fibrous tissue. Narrowings, beginning strictures, are observed in some cases, which are the result of hard infiltrations. Erosions may be found along the urethra, slightly elevated granular areas, small ulcerations, or granulations.

**Symptoms.**—Chronic urethritis is divided into the anterior and the posterior forms, both of which are present in a great proportion of the cases. The symptoms vary considerably, according to which part of the canal is involved, but far less than in the acute form.

Chronic Anterior Urethritis.—The symptoms of a chronic anterior urethritis are usually a persistent discharge, and pain or a heavy feeling in the perineum when the perineal portion of the urethra is involved. A point to be remembered is that neither these vague subjective signs, nor the more definite symptom of discharge are measures of the degree of the inflammation. Severe urethral involvement may occur with very slight subjective disturbances; while in a mild inflammation the symptoms may be marked, as the pain and other symptoms depend in a great measure on the nervous susceptibility of the patient, as I have already stated.

Disturbances of urination are not characteristic of chronic anterior urethritis unless it be accompanied by a tight stricture. They do not usually occur until the posterior urethra, the prostate or bladder have become involved.

The discharge is ordinarily very scanty, or there may be none at all present for some time; whereas in other cases, especially when a stricture is present, there may be a constant oozing. The amount of the discharge is always greater in the morning, as it has had more time to accumulate during the night if the patient does not urinate. In most cases, the discharge appears as a single drop in the morning, called by the French the "goutte militaire," on account of the frequency of its occurrence among soldiers. The color of this drop is usually grayish-white, or milky and glairy. In some instances, the discharge is so scanty that the lips of the meatus are merely stuck together; but in the presence of an exacerbation of the inflammation it may become profuse and yellowish. The discharge may be so thick that it no longer flows as far as the meatus, or so scant that it covers only a local area of inflammation as a smear.

*Shreds in the Urine.*—Scanty discharge covering local areas as a smear is rolled up into shreds by the action of the urine passing down the canal, and they are voided in it. Shreds are, therefore, of the same composition as the urethral discharge. They differ greatly in appearance and yet it is impossible to say, from looking at them, from what part of the canal they come. They also vary in their weight. When a patient urinates in a glass tube or glass vessel of any kind, heavy shreds containing a large amount of pus sink rapidly to the bottom of the glass, while light shreds containing less or no pus, but principally mucus and epithelia, float in the urine for a time and then gradually sink and join the deposit in the bottom of the tube. The small shreds, which are floccular, or resemble small points or commas, are especially light. For many years it was thought that the comma-shaped shreds came from the posterior urethra and were washed out of the prostatic follicles. But it is now generally believed that they also come from the anterior part of the canal.

The only shreds which a trained observer can trace are those from the ejaculatory ducts, as they are long, thin, translucent and wavy, and often contain refractive globules resembling air bubbles, together with a few white blood cells and spermatozoa. They are typical of spermatorrhea.

The location of the process in chronic urethritis cannot be accurately determined by inspection of the shreds, while the microscopical examination gives us more information concerning the character of the shreds and the infection than it does regarding their source. The urethral discharge may appear the same under the microscope, whether it comes from the anterior or posterior part of the canal, but certain elements often give us an idea of existing complications, as, for example, the presence of spermatozoa points to trouble with the vesicles, and amylaceous bodies to the prostate. (See Table in chapter on Discharges, Vol. I.)

*The Discharge.*—The discharge consists of pus, mucus, epithelia and bacteria. *Mucus* is due to an increased urethral secretion and to degeneration of the epithelium. It is generally found in the terminal stage of the disease.

*Pus* cells differ from those in acute attacks, as they often show fat granules and other signs of disintegration, whereas after they are stained they show fewer gonococci than do those accompanying the acute process.

The number of pus cells is less than the epithelia in the chronic stages, while in the acute they predominate.

*Epithelial cells* form a most important part of a chronic urethral discharge.

*Bacteria* in chronic urethritis are either gonococci or a mixed infection. The gonococci may be present or absent in the discharge of a patient with chronic urethritis. Occasionally, when they have not been found for a long period, they may suddenly reappear in large quantities during a relapse of the inflammation. As the disease goes on, the percentage of cases in which the gonococcus is found gradually decreases. At the end of two months, it is found in twenty per cent; of three months, in seventeen per cent; of five months, fourteen per

cent; and so on to two years, when it is five per cent. At three years it is only two and a half per cent.

It may be asserted that the more numerous the pus cells the more gonococci are found, although in old cases they may be attenuated and not intracellular. Whether a chronic urethritis still retains its power of infection or not is a difficult question to answer. If the gonococci are found in the shreds, the infection is present. But gonococci may be present in the lower genital tract, principally in the urethral and prostatic follicles, and yet not be found unless there is sufficient irritation brought about to give rise to an acute congestion or an inflammation.

The *mixed infection* in chronic urethritis consists of the bacteria associated with the gonococcus, which are various types of bacilli and cocci of a non-pathogenic variety. Besides these saprophytic germs, the staphylococcus, streptococcus and the colon bacillus may also be present. These germs play an important rôle and are often the cause of the continuation of chronic conditions that would otherwise have been cured had the gonococci alone existed.

Chronic Posterior Urethritis.—The symptoms differ from those of inflammation of the anterior portion of the canal, although an anterior urethritis usually accompanies it, and in many cases a chronic prostatitis as well. Disturbances of micturition are most prominent in posterior inflammations, the principal of which is frequent and precipitate urination; in the latter case the desire to void often comes on so suddenly that the patient has hardly time to reach the urinal. The frequency, however, is not so marked as in cases of acute posterior urethritis. In old attacks of urethritis accompanying stricture, both the posterior urethra and the bladder may be inflamed, in which case frequency of urination is more marked, especially when acute exacerbations occur, due to exposure to wet and cold, or excesses in alcoholics or in venery.

Pain may be present, usually of a dull character, in the perineum and in the glans penis, especially during micturition. More pain, however, is experienced by a patient with a sensitive nervous system, especially in neurasthenia.

**Examination and Diagnosis.**—Diagnosis.—The diagnosis is determined by an examination of the patient and specimens of the discharge.

One of the important points to discover is the respective degree of the involvement of the anterior and posterior urethra. Urethral washings will help us in determining this. It must be remembered that in these chronic cases the posterior urethra discharges but little, not sufficient to flow back into the bladder and cause the bladder urine to be turbid, as often occurs in cases of acute posterior urethritis.

A catheter or long irrigating tip should be passed down the anterior urethra to the bulb and connected with a fountain syringe, the bottom of which should not be over two feet above the pubes of a patient when lying on his back. The water should then be allowed to flow, thus washing out the anterior urethra

from the bulb forward. The washings are caught in a glass or a tube and examined for shreds. If none are present, there is no anterior urethritis and the washings are discontinued. If they are present, the washing is continued until no more come away in the anterior urethral washings. It is then evident that the first urine passed will contain the washings of the posterior urethra plus the washings of the bladder, ureters and kidneys.

The patient then passes urine. After he has passed an ounce it is inspected.

If the urethral washings just referred to contain shreds and there are none seen in the first urine passed, the inflammation is only in the anterior urethra.

If, on the other hand, the washings of the anterior urethra contain no shreds and the first urine does contain them, the inflammation is in the posterior urethra, bladder, ureters or kidneys.

The patient is then asked to pass a second specimen of urine and if the second urine passed is clear and contains no shreds, it can be said definitely that there is no marked suppurative process in the bladder, ureters or kidneys, and that the pus shreds in the first urine show the posterior urethra to be involved.

If, however, the first and second urines passed after the anterior urethra has been washed are turbid, and the turbidity is due to pus, then the pus in the second urine comes from the bladder or kidney. The first of these specimens should then be examined to see if it contains urethral shreds from the posterior urethra alone or together with prostatic elements, the second specimen to see if it contains bladder or kidney elements.

In an acute posterior urethritis, or an acute exacerbation of a chronic posterior urethritis, sufficient pus may accumulate in the posterior urethra to flow back into the bladder and give rise to a turbidity of the first and second urines. In such a case the turbidity would be much less marked in the second than in the first specimen of urine. In a chronic posterior urethritis, however, not in a state of exacerbation, there would not be sufficient pus to flow back into the bladder and the second urine would be clear unless an inflammation of the bladder, ureters or kidneys were present, in which case the location of the inflammation above the bladder sphincter would have to be determined by other measures. Therefore, when a patient passes turbid urine the second time, with pus and shreds or clumps of pus, after the first urine has washed the urethra clean, there is but one way to discover the location of the pus-producing area. The second specimen should then be examined to see if it contains pathological elements from the bladder or kidneys. This subject has been considered under both the chapter on Examination of the Urine and Examination of the Bladder and Kidneys, and will therefore be given here very briefly.

Examination.—If it is considered advisable, the bladder can be examined with the cystoscope for the presence or absence of disease of that organ; and

the condition of the kidneys determined by taking samples of the separate urines with the ureteral catheters and examining these specimens for kidney elements.

A further method of examining a patient's urethra in chronic urethritis is by palpating the urethra to see if there are any periurethral nodules present which indicate an involvement of the urethral glands. Bougies à boule are then passed into the urethra to discover narrowings of the meatus or other portions of the anterior urethra. If no narrowings are detected, then a sound corresponding to the largest bougie à boule that has been introduced into the anterior urethra is passed to see if it will also go through the posterior urethra into the bladder without interference. If narrowings of the meatus or anterior urethra are found, they are sufficient to give rise to a chronic urethritis and it will be necessary to dilate or cut them until they are of the same size as the remainder of the urethra. (See chapter on Urological Examination of Patients and Technique of Instrumentation.)

It must be remembered that any instrument that passes through the anterior urethra will probably pass through the posterior portion, as the latter is larger and much more dilatable. In every case of stricture on which I perform a perineal section, I am able to pass my forefinger easily through the posterior portion of the urethra into the bladder.

If there are no narrowings along the anterior urethra but a chronic inflammation continues, then a urethroscopic examination should be made to detect the presence of local areas of inflammation. The examiner, in looking through the urethroscope in a recent case, may see the condition known as *soft infiltrations,* that is, a marked congestion of the mucous membrane, usually brighter about the mouths of the glands, although, where the epithelium has been thrown off, they have a dull appearance. The crypts of Morgagni appear dark red with slightly enlarged mouths, and are often seen to secrete a glairy fluid, or they may show cystlike enlargements. The longitudinal striations are either obliterated owing to the swelling, or are more marked owing to the dark coloring. The longitudinal folds are usually fewer in number and bulge more markedly. The central depression is closed. (See Plates on Urethroscopy, Vol. I.)

In older cases he may see *hard infiltrations,* consisting of two forms, the dry and the glandular. The dry form occurs in over fifty per cent of the cases, especially in those that have not been treated by dilatation, and is called dry on account of the dry appearance of the involved areas. In introducing the urethroscope in the urethra, the toughness of its walls is first noticed, due to the presence of fibrous tissue. The central depression is always patulous in the affected portion, while in the healthy part it is closed. The mouths of the glands are invisible, or but slightly altered.

In the glandular form, the longitudinal striations disappear and the folds are not present, or reduced in number and increased in size. The mucosa is always paler than in the healthy portion, and is desquamated, although the

mouths of the glands may appear bright red, with slightly swollen margins. In both of these forms of hard infiltrations, the appearance varies in different locations and degrees until the pale appearance of a narrowing in the canal showing a stricture presents itself. When a tube No. 23 French cannot pass any portion of a urethra, a stricture is said to be present. Besides these localized areas of inflammation and thickenings, granular patches showing themselves as slight elevations with an irregular surface, papillary growths which are areas of granulations resembling verrucæ acuminatæ, polyps which are long papillæ and ulcers may also be seen as complications of chronic urethritis.

Differential Diagnosis.—A leakage may, however, come from the posterior urethra when it is healthy through a discharge into it from an inflamed or atonic prostate or vesicle, and this may flow along it to the meatus as a morning drop or moisture. For this reason a chronic urethritis must be differentiated from prostatorrhea and spermatorrhea by a laboratory examination.

In chronic urethritis, there is a gleety discharge, of a gray or yellow-gray color, consisting of mucus, epithelia, a small amount of pus and some gonococci; or the gonococci may be absent and the pus either absent or represented by a few leucocytes. In this latter condition, when the discharge consists of mucus and epithelia with perhaps a few leucocytes and only shows itself as a morning drop, it is difficult to diagnosticate it from a prostatorrhea or spermatorrhea. There are, however, certain clinical symptoms that will give us a clew as to its origin, while the microscope will render the differentiation more positive.

In *prostatorrhea,* the patient complains of a morning drop that is white or white-gray. He says that when straining at stool a white substance like the white of egg or glycerin appears at the meatus and that at times this follows urination. If a specimen of the morning drop is obtained, it will be found to contain prostatic epithelia (cylindrical), amyloid bodies, Böttcher's sperm crystals and sometimes casts of the prostatic ducts.

In *spermatorrhea,* the patient complains of oozing of semen, "losing of nature" and various other expressions, together perhaps with symptoms of sexual hypochondriasis, loss of desire or even impotence. There is a white or white-gray discharge. If a specimen of the morning drop is examined, it will be found to contain spermatozoa and spermin crystals. (Chapter on Discharges, Vol. I.)

## TREATMENT OF GONOCOCCAL URETHRITIS

The treatment of gonorrheal urethritis is exceedingly difficult to write, as every book on genito-urinary trouble contains the description of methods that have been handed down from one author to another, some of which have long since been discarded or so modified that they are now quite different from what they formerly were.

I feel, however, that it is necessary to include in this chapter much that I would like to omit, because of the great interest that is taken in the subject, as gonococcal urethritis is the most frequent of all the diseases of the urinary tract, occurring probably in ninety per cent of the cases.

In teaching diseases of the urinary tract, when in the course of lecture I invite the students to ask questions—and all of the students are graduates and practitioners—many of the questions are of such a nature that I can but be impressed with the idea that they confuse methods of twenty years ago with those of the present day. It is difficult, therefore, to write a full discussion on the treatment of urethritis without having it involved, contradictory and confusing. If, however, I were to consider only what I believe to be necessary at the present writing the discussion would be thought very incomplete and in a few years would probably be considered useless. I will therefore write, bearing in mind the many questions that have been asked me by the practitioners who have attended my clinics, what I consider the present-day treatment of urethritis employed by different urologists, with comments upon the subject.

## Treatment of Acute Urethritis

**Prophylactic or Preventive Treatment.**—It is not within the scope of this book to discuss the moral, legislative and sanitary measures that should be adopted for the prevention of urethral infection. The education of boys and young men in the dangers of illicit intercourse and in the sequelæ of this disease should be attended to by those interested in their moral welfare. The supervision of prostitution and the establishment of isolation hospitals for infected persons suffering from venereal diseases are all questions which do not come within the scope of this work.

The best and safest way to prevent urethral infection in coitus is the use of an impervious condom. Next to that, a series of antiseptic measures may be adopted which are more or less efficacious. There is, first of all, absolute cleanliness of the parts, secured by a liberal use of soap and water immediately after coitus. When intercourse is indulged in, care should be taken to avoid prolonged contact and the repeated performance of the act without a thorough disinfection of the parts intervening. Coitus with a menstruating woman should be avoided, if for no other reason than that infection is more likely to occur during or immediately after the menstrual period in a woman who has suffered from a gonorrhea and in whom the infection is latent between her periods.

Next to a thorough cleansing with soap and water, the passage of urine immediately after coitus is a useful precaution, as the washing out of the canal tends to remove the infection mechanically. In doing this the lips of the meatus can be interruptedly pinched during urination so that the urine will dilate and better cleanse the fossa navicularis.

But these measures cannot be compared in efficacy with some bactericidal solution introduced into the urethra after coitus, for the purpose of destroying any gonococci that may have become lodged therein. A great variety of remedies have been recommended for this purpose, the principal of which are solutions of potassium permanganate (1:500), silver nitrate (1:500), mercuric chlorid (1:5,000), injected about an inch into the urethra. These injections have been supplanted by the instillation by means of a medicine dropper of a few drops of an argyrol or protargol solution, which have been widely recommended and probably constitute the safest and least harmful prophylactic treatment. The introduction of a few drops of a twenty-per-cent solution of protargol, containing a small amount of glycerin, or a strong solution of argyrol, into the fossa navicularis is the most generally used. Frank, of Berlin, has devised a special drop bottle for this purpose with a small glass dropper which can be introduced into the meatus without injury. I have never recommended a stronger solution than ten per cent of protargol or twenty per cent of argyrol as a prophylactic, and have found the former most satisfactory.

A recent writer recommends a set of collapsible tubes, which can be carried in the vest pocket, one of which contains a mixture of lanolin and vaselin for anointing the parts before coitus; the other tube has a conical nozzle and contains a lubricant consisting of gelatin, glycerin, water and one tenth of one per cent of mercuric oxycyanid, to be squeezed into the urethra after coitus.

The efficiency of all these methods depends upon the fact that the gonococcus during coitus enters the anterior portion of the urethra and usually lodges in the fossa navicularis. In this situation, the strong protargol solution or other antiseptics used can generally reach it immediately after the act, before it has time to cause much if any infection. Perhaps the most striking evidence of the efficacy of these measures of prevention is found in the statistics published recently by Feistmantel.[1] Six hundred and forty soldiers were divided into three groups: One group received no instruction regarding prophylaxis and approximately five and four fifths per cent were infected. Another group were simply instructed to urinate after coitus and to wash the genitals with soap and water, with the resulting approximate percentage of infection in four per cent. In the group treated prophylactically, the approximate percentage was only two and one fifth per cent. Furthermore, in no case did an infection occur when a thorough disinfection of the genitals had been performed within three hours after the coitus. Feistmantel said further that the best method of prophylaxis is the use of a 1:1,000 solution of mercuric chlorid externally after a thorough cleansing of the genitals with soap and water, followed by the instillation of a few drops of a five-per-cent albargin, or a five-per-cent protargol, solution con-

[1] *Wiener med. Wochenschr.*, 1905, Nos. 13 to 17.

taining one part in ten of glycerin. He also recommends a two-per-cent solution of albargin, given with a hand syringe, to be held in the urethra for from two to five minutes. I have also found a ten- to twenty-per-cent argyrol solution, freshly made, very satisfactory, but not as reliable as protargol. Feistmantel thinks that almost two thirds of the venereal diseases could be prevented by prophylactic precautions.

**Abortive Treatment.**—The abortive treatment of acute anterior urethritis is recommended as soon as there is a slight mucoid discharge containing no gonococci. In case it is employed, the patient should be warned that this treatment often fails and that it is not generally recommended.

The older methods of aborting gonorrhea were so heroic that they usually caused serious complications and induced great pain and discomfort, the treatment being in some cases worse than the disease. It consisted of an injection of about a drachm of a silver solution of from three to fifteen per cent in strength into the urethra.

The abortive treatment is now rarely used by men doing special work in urethral diseases. In case it is, however, the method of administering the solution differs. Some pass a catheter in for three inches and then inject the solution; whereas others introduce a urethral speculum and apply it to the first inch of the canal about and behind the fossa navicularis, by means of a swab. The reaction depends usually upon the strength of the solution. A three-per-cent solution of nitrate of silver usually causes but little reaction, whereas from ten per cent to fifteen per cent often causes most distressing complications, such as strangury, very difficult and painful urination and even retention. Sometimes the entire urethra became involved and even the bladder. Strictures are liable to follow such treatment. I would therefore advise those who employ this method never to use a solution stronger than five per cent.

The strongest abortive treatment that has come under my observation was three years ago, when a young man of the clinic introduced a stick of nitrate of silver into the urethra with the object of aborting the attack. This was followed by intense reaction and retention of urine. The organ swelled to more than twice the normal size. The retention lasted for ten days, during which time he had to be catheterized constantly. The swelling continued for two weeks, going down gradually under a dressing of lead-and-opium wash. The patient recovered, however, after passing a gray-colored cast three inches long resembling a slough of the urethra. Since then, with the exception of a strictured condition of that part of his canal, nothing of a serious nature has happened and he has been able to urinate spontaneously, although his stream is diminished in caliber. The urethritis was aborted, but the treatment was most heroic.

Another case was reported at the Academy of Medicine fifteen years ago by Dr. Collyer of this city concerning a patient who had tried to abort an im-

pending attack of urethritis by injecting himself with a solution of chlorid of zinc of an unknown strength. It was followed by considerable reaction, but no strangury or retention. The reaction subsided in a few days and was followed by expulsion of a cast of the urethra from the vesical neck (internal meatus) to the external meatus. The urethral cast on microscopical examination showed the superficial and deep urethral layers, in which were found the blood vessels, glands and other component parts. Following this, he had strictures of the anterior urethra which had to be dilated from time to time. They have been slowly contracting until, at the present time, only a No. 10 French sound can be passed, and he is at last beginning to consider seriously the advisability of an operation.

When a reaction follows an abortive injection, the patient should be kept quiet. External applications of cold water or lead-and-opium wash should be made. Saline diluents of acetate of potash and sp. ætheri nitriosi and antispasmodics, as belladonna or hyoscyamus, and anodynes containing some opiate should be given internally. Some urologists have advocated as an abortive treatment injections, twice a day, by means of a urethral syringe, of a solution of bichlorid of mercury (1:5,000); nitrate of silver (1:500); permanganate of potash (1:500); and also the organic preparations of silver which have the advantage of being comparatively nonirritant, such as a twenty-per-cent solution of argyrol or a four-per-cent solution of protargol. I do not consider such treatment as coming under the head of abortive methods, but rather as a special method of quick cure that most patients cannot well tolerate. It is a method that I do not recommend.

**Methodical Treatment.**—In the treatment of every case of gonorrhea, three objects are sought: (1) To protect the patient from influences that tend to prolong the disease or produce complications; (2) to check the discharge; (3) to relieve the discomfort. The first of these is attained by the careful regulation of the habits, the hygiene and the diet of the patient, the second and third by local treatment and by the use of internal remedies. I have read that, if a patient be put to bed, kept upon low diet and made to drink freely of such bland diluents as hot flaxseed tea and alkaline diuretics, the disease would probably run a mild course and subside with but little local treatment. In a large experience in the treatment of such cases in the hospital clinic and private practice, I cannot recall ever having met a patient who has been treated in this way. It is difficult to induce active men, in this country, even in their moments of leisure, to stay at home and rest on account of what they consider a slight ailment; and even when they do lounge about the house in a reclining position and read or do nothing, they do not in my experience recover more quickly. In fact, many of the cases have done badly who were so concerned about their condition as to give up everything in order to be cured quickly. I think it is much better for them to attend to their daily duties, to stay at home and rest

after business hours and to wear a suspensory to keep the inflamed parts as quiet as possible.

Such exercises as dancing, tennis, bicycle and horseback riding should be especially avoided. Sexual excitement should be interdicted and coitus should not be allowed. The bowels should be kept regular by the use of saline laxatives, such as Apenta, Hunyadi and Carabaña waters. It is very important to keep the lower extremities warm and dry, as chilling of these members and wet feet tend to congest the urethra and induce complications.

The discharge should drain into special dressings of absorbent cotton or gauze, the cleanest being the butterfly dressing. This is composed of a piece

Fig. 714.—Butterfly Dressing Over Glans. (Taylor.)

Fig. 715.—Same With the Prepuce Over It. (Taylor.)

of gauze folded in two or three thicknesses, about four inches square, in which an opening is made to admit the glans, and, after putting this on until it is behind the corona, the prepuce is pushed forward and the protruding gauze catches the secretion (Figs. 714 and 715). A piece of absorbent cotton placed over the meatus with the prepuce drawn over it is equally efficacious. Circumcised patients can wear a small bag in the bottom of which a piece of loose gauze is placed. This can be either pinned to a suspensory or to a piece of tape extending around the back and hips. The tying of bandages about the organ is especially bad, as it prevents free drainage and predisposes to stricture formation. Bags and absorbent cotton are condemned by many, but in my opinion they are much better than bandages tied on. The Johnson and Johnson Red Cross

athletic bandage, by holding the genitals up against the pubes, is the most comfortable dressing and will hold in place the piece of cotton or gauze placed over the meatus.

The patient should be warned as to the danger of infecting his eyes by means of the secretion, and should be careful to wash his hands after handling the organ.

The directions to patients suffering from urethritis are as follows:

1. Diet.—Avoid all foods which give rise to irritating compounds in the urine, such as asparagus, tomatoes, rhubarb and all sour, pickled and spiced dishes, especially the condiments, such as pepper, pepper sauce, catsup, chili sauce, etc.

2. Drinks.—Abstain from liquors, wines, beers and ginger ale. Claret when mixed with water is the least harmful and is sometimes allowed in the later stages of the disease if the patient needs strengthening. Coffee and tea, taken moderately, do no harm, but in large quantities they increase the nervousness naturally accompanying this trouble and increase the local nervous irritability as well. Milk between meals is beneficial if the patient's appetite is poor, or a milk diet may be advised if there are any complications which indicate it.

3. Tobacco may be used in moderation. About one third of the usual amount.

4. The bowels should be kept open, and if there be any tendency to constipation the patient should take Seidlitz powders, or salines, such as Apenta water, citrate of magnesia, or Rochelle salts, in the morning, half an hour before breakfast.

5. The Urine.—In order to *keep the urine bland* and diluted, so as not to cause irritation of the diseased parts in passing, the patient should drink large quantities of water, and if there be much burning, some of the alkaline mineral waters, such as Vichy, Seltzer, or Apollinaris, should be drunk.

6. Sexual excitement should be avoided by abstaining from medicines containing strychnin, phosphorus, quinin or other drugs which produce sexual stimulation. Sexual intercourse should be absolutely abstained from, as by exciting the deeper portions of the genital tract it is apt to give rise to complications and would infect the woman, giving her the disease, and perhaps causing some dangerous or even fatal complications, and further, if she be with child, causing an inflammation of the child's eyes, resulting in probable blindness. Many of the diseases peculiar to women, and much suffering which women go through, are caused by gonorrheal infection.

7. Toilet.—Bathe the parts, night and morning, with warm water. Keep a piece of cotton over the end of the organ, held in place by the prepuce drawn over it. This is to be changed for a fresh piece each time after urinating.

Suggestion is made that the patient be instructed to provide himself with

a two-drachm syringe with blunt nozzle, not the sharp-pointed which are sometimes given them by the druggists.

In case injections are prescribed, they are usually given four times daily, after urinating. The method of injection is as follows: Fill the syringe with warm water, and inject into the urethra, allowing it to escape immediately. Then fill the syringe with the injection fluid. Insert the tip of the syringe into the urethra; grasp the end of the organ and the tip of the syringe with the forefinger of the left hand bent in such a way as to form a ring around the former, so as not to allow any of the fluid to escape along the sides of the nozzle, as it would if the tip be grasped between the thumb and forefinger. Then press the piston slowly and steadily, forcing the fluid into the urethra, where it should be held for five minutes before it is allowed to escape. (See page 169, Vol. I.)

The hands should be washed thoroughly after touching the parts, either for the purpose of urinating or injection, and care should be taken not to leave the towel where others may use it and dry their faces on it, as in this way they may introduce some of the contagion into their eyes and thus cause an inflammation which may result in loss of the eyesight. For the same reason be careful not to touch your own eyes with your fingers before washing them.

8. Mode of Life.—Dress warmly and do not expose yourself unnecessarily to cold or wet. Keep the feet dry and warm and wear rubbers in rainy or stormy weather. Exercise moderately to a degree that would tend to improve the physical condition and not to overstrain or overheat. Avoid bicycle and horseback riding.

9. Complications.—Remember that complications may occur which are far worse than the disease itself. They usually come on after the tenth day and are ushered in by frequency of urination and pain in the perineal region of the rectum. If there be pain or a sense of weight in the external genitals, an Army and Navy suspensory bandage should be worn. In case of painful erections at night, take a hot bath before going to bed and immerse the organ in hot water when the erection occurs. Standing on a cold floor, or holding one leg elevated in an extended position will usually suffice to cause an erection to subside. If you suddenly find that you cannot pass your urine, you should take a hot sitz bath. If this does not produce a flow of urine, you should call a physician.

10. Prevention.—*Prevention of gonorrheal infection* is best brought about by abstaining from intercourse.

N. B. Cure.—A patient is well when there is no more discharge, when the urine shows no more shreds and when there is no more frequency of urination nor feeling of discomfort in the parts. The patient should not drink beer or spirits, nor should he have intercourse for three weeks after the discharge has ceased, in order to avoid a recurrence.

Many men consider themselves well when the disagreeable acute symptoms

have passed away, and when but a slight discharge is present. No man should discontinue treatment until his physician after careful examination pronounces him cured.

**General Treatment.**—INTERNAL TREATMENT.—The internal treatment of gonorrhea consists in administering remedies excreted partly through the urine, which act upon the mucous membrane of the urethra. The remedies employed are the alkaline diluents, the balsamics and the antiseptics. At the beginning of an attack, when the symptoms are very acute, as shown by redness of the glans and edema of the prepuce, balsamics are not considered advisable and the treatment usually consists of the directions for hygiene and diet already mentioned, together with saline laxatives, diluents and hot sitz baths.

*Alkaline Diluents.*—The alkaline salts of potassium and sodium are administered for the purpose of reducing the acidity of the urine, thus making it less irritating to the urethra. The potash salts, while not so well borne by the stomach, are more efficient as diuretics and for rendering the urine alkaline. They are the acetate, bicarbonate and citrate of potash in doses of from fifteen to thirty grains.

The action of all these salts of sodium and potassium is to reduce the acidity of the urine in case it is acid. They escape by the kidneys as carbonates. They act directly upon the nerves of the kidney and upon the renal cells and increase the water and solids excreted, and are, therefore, direct diuretics. The acetate is the most efficient, but not as well borne by the stomach as the citrate. An efficient diuent is the following:

| | | Grams. |
|---|---|---|
| ℞ Potass. acetat. | ℥j | 30.00 |
| Sp. ætheris nitrosi | ℥j | 30.00 |
| Aq. gaultheriæ ... q.s. ad. | ℥iv | 120.00 |

M. and S.: A teaspoonful in a glass of water three times a day between meals.

This we call in the clinic the "Potash and Niter Mixture."

The acetate, bicarbonate and citrate are prescribed in doses of from fifteen to thirty grains three times a day in a glass of water between meals. They are given generally combined in mixtures, but when given alone are best tolerated in solutions containing some sirup, as the sirup of bitter orange.

*Balsamics.*—These are clinically known as antiblennorrhagics. They are the oleoresins or oils. The best known of these are: Ol. santal, balsam copaiba, oleoresin or oil of cubebs, Gurjun balsam, balsam Tolu, balsam Peru, kava-kava, natico and oil of wintergreen. These oleoresinates are excreted by the kidneys and exist in the urine as potassium and sodium resinates. They have an action on the lower urinary tract of a specific and slightly anti-

septic nature, making the soil less favorable for bacterial growths. They relieve the acute symptoms, diminish the discharge and tend to prevent complications.

Those principally used are sandalwood oil, copaiba and cubebs; kava-kava is also popular, but the others are rarely employed.

Sandalwood oil is the best of these remedies, the active principle being santalol. The ordinary dose is fifteen drops three times a day, although double this dose is frequently given. The best method of prescribing it is in capsules of from five to ten minims each. The ol. santal, like the other balsamics, is irritating to the gastro-intestinal tract and the kidneys and efforts have been made to modify this by combining it with other drugs. The most popular of these combinations are salo-santal and gonosan. Salo-santal is a liquid composed of one third salol and two thirds ol. santal, with a few drops of wintergreen. It has a very agreeable taste and is given in ten- to twenty-drop doses, after meals, in capsules or otherwise. Gonosan is a liquid composed of the resin of kava-kava one quarter, and the other three quarters ol. santal. It is given after meals in five- to ten-drop doses in capsules.

Balsam copaiba is next in order of merit. The regular dose is fifteen drops, three times a day, although it can be prescribed in doses of as high as thirty drops. It is best given in capsules after meals.

The oil of cubebs is next in order and is given in from five- to ten-minim doses, usually in conjunction with copaiba.

Formerly it was customary to give the balsamics in very large amounts and some authors still advocate this plan. At present, however, the internal treatment in the management of acute gonorrhea is not so much relied on and it is considered sufficient to use the antiblennorrhagics in moderate doses and only for a short time, chiefly during the declining stage of the acute attack.

Personally, I believe in large doses of the balsams and give both ol. santal and copaiba from thirty to ninety minims a day in divided doses. In the clinic I use considerable copaiba, but in private practice only ol. santal or its combination. Both ol. santal and copaiba irritate the mucous membrane of the stomach, giving rise to indigestion and nausea, although it is much less marked when using ol. santal. Copaiba sometimes causes erythema, urticaria or other skin eruptions. The urticaria is said to be worse at night and the wheals are massed in groups, especially about the wrists, hips and face. It may be accompanied by slight fever, anorexia and other gastro-intestinal symptoms. The copaiba rash that I have seen has been more of the erythematous type and resembles measles. It has occurred principally in the groins and the inner side of the thighs, but it is also found on the face and other parts of the body. The eruption usually disappears upon stopping the drugs and upon using appropriate symptomatic treatment.

Patients taking ol. santal or copaiba, especially the former, often suffer from pain in the back or loins due to renal irritation and the urine is said at times to contain some blood owing to renal congestion produced. I have never seen any evidence of hematuria by a visual examination of the urine, although I frequently give half a drachm three times a day. The albuminous reaction in the urine of patients suffering from acute gonococcal urethritis is generally nuclear albumin due to the pus present. If a patient with acute urethritis of the anterior urethra passes sufficient urine to wash the pus out of the canal and then passes the remainder containing no pus, any precipitate obtained by boiling the specimen of the remaining urine may be due to the resins contained in the drugs and not to serum albumin.

*Urinary Antiseptics.*—These consist of boric acid, salicylic acid, oil of wintergreen, salol, benzoic acid, benzoate of soda, urotropin and eucalyptol. Urinary antiseptics, in the strict sense of the term, are not generally used in the treatment of acute urethritis, although they enter into combinations that are used for this purpose. The balsamics, which have a mild antiseptic property, are preferred. Urotropin has been tried by many practitioners and is still used by some. Generally tablets of seven and one half grains taken three times a day are given. Many consider methylene blue as an important drug to use internally and give it in one- or two-grain doses, three times a day after meals. The combination of methylene blue and oil of wintergreen has been used in the following prescription:

℞ Methylene blue ..... gr. 1 .06
Ol. gaultheriæ ..... ♏ x .6

M. Sig.: One such dose in capsule three times a day after meals.

Methylene blue stains the urine greenish blue and the patient should be informed of this when it is prescribed. I have never seen any improvement in cases of acute urethritis that I thought could be attributed to methylene blue. Oil of wintergreen is a good urinary antiseptic, but not of much value in the acute stage of inflammation.

*Combination Prescriptions.*—Having considered the diluents, the alkalines, the balsamics and the urinary antiseptics, we can now give our attention to certain combinations that are employed in prescribing these remedies. Such prescriptions are used principally in dispensary practice, although often prescribed for private patients. The oldest and most tried in this country is the Lafayette Mixture. This mixture is liable to cause some disturbance of the stomach and intestines and is not an agreeable preparation to use, but it is inexpensive and fulfills all the requirements of balsamic and alkaline therapy. Each fluid drachm of the Lafayette Mixture contains seven and a half minims of copaiba. The mixture should be well shaken before using.

*Lafayette Mixture*

℞ Copaibæ .....
Spt. ætheris nitrosi .....
Spt. lavandulæ .....āā ℥ss 15.
Potass. liq. (U.S.P.) ..... ʒj 4.
Syr. simplicis .....
Muc. acaciæ .....
Aq. gaultheriæ .....āā ad ℥iv 120.
M. Sig.: ʒij after meals.

Another prescription for Lafayette Mixture is:

℞ Copaibæ .....
Sp. ætheris nitrosi .....āā ℥ss 15.00
Liq. potass. ..... ʒj 4.00
Ext. glycerizæ ..... ʒij 8.00
Ol. gaultheriæ ..... ♏ x .75
Syr. acaciæ .....ad ℥iv 120.00
M. S.: ʒij after meals.

In the clinic I use a mixture called the Copaiba Emulsion consisting of:

*Copaiba Emulsion*

℞ Balsami copaibæ ..... ℥ss 15.
Potassi citratis ..... ℥ss 15.
Muc. acaciæ .....
Syrup. simp. .....
Aq. gaultheriæ .....āā q.s. ad ℥iv 120.
M. Sig.: ʒij t.i.d. between meals.

In administering ol. santali, besides giving it in capsule or in combination, under the names of gonosan or salo-santal, as already mentioned, it can be given on a lump of sugar or in an emulsion in the same manner as balsam copaiba. My Ol. Santali Emulsion is the same as the Copaiba Emulsion with respect to the other ingredients. I prefer it to the other combined mixtures. It is as follows:

*Ol. Santal Emulsion*

℞ Ol. santal ..... ℥ss 15.00
Potass. citrat. ..... ℥ss 15.00
Syrup. simp. .....
Muc. acaciæ .....
Aq. gaultheriæ .....āā ad ℥iv 120.00
M. Sig.: ʒij three times a day between meals.

In giving the balsamics in acute urethritis, I aim rather at a quick effect in changing the inflammation from an acute to a subacute stage, than to a prolonged effect by smaller doses. I consequently prescribe the emulsion of ol. santal or the emulsion of copaiba as follows:

| | | |
|---|---|---|
| First day | ʒij | three times a day after meals. |
| Second day | ʒiij | " " " " " |
| Third day | ʒiv | " " " " " |
| Fourth day | ʒiij | " " " " " |
| Fifth day | ʒij | " " " " " |

N. B. In case it gives rise to pain in the back, the dose is decreased or discontinued.

After this I continue it in two-drachm doses or else discontinue it. I generally use it when I am trying to modify the discharge sufficiently to begin injections or irrigations, or else in severe cases of posterior urethritis when I do not care to treat the patient by the urethra.

Casper prescribes ol. santal or copaiba with equal parts of fluid extract of pichi with some peppermint flavoring:

| | | | |
|---|---|---|---|
| ℞ | Ol. santal (or copaibæ) | ℥j | 30.00 |
| | Ext. pichi fld. | ℥j | 30.00 |
| | Aq. menth. pip. | ℥ss | 15.00 |

M. Sig.: Twenty drops three times a day after meals.

A capsule that is highly recommended is one that is composed of salol, ol. santal and copaiba, made as follows:

| | | | |
|---|---|---|---|
| ℞ | Salol | grs. iij | 0.2 |
| | Copaibæ | | |
| | Ol. santal | āā ♏ iij | 0.2 |
| | Ol. cinnamon | ♏ j | 0.06 |

M. F. in capsula una. Sig.: 6 to 10 tales capsulæ a day.

Chordee.—The condition of painful erection (chordee) is one of the most difficult symptoms to relieve in acute urethritis and many methods are employed to prevent and alleviate it, among which are:

(1) Keep the bowels open with salines.

(2) Sleep in a hard bed with light covering.

(3) Tie a knotted towel about the body so that the knot comes on the spinal column, to prevent turning on the back.

(4) Before retiring, take a sitz bath as hot as can be borne, lasting from ten to twenty minutes, or prolonged soaking of the penis in hot water.

Before going to bed take heroin, gr. $\frac{1}{16}$ to $\frac{1}{10}$; lupulin, $\frac{1}{2}$ to 1 drachm; acetanilid, antipyrin, trional or phenalgin, grs. 5 to 10; codein, gr. $\frac{1}{4}$ to 1; sulfonal or veronal, grs. xv; morphin, gr. $\frac{1}{4}$; or camphor monobromate, grs. 10 to 20.

| | | | |
|---|---|---|---|
| ℞ Morphin | gr. | $\frac{1}{6}$ | .01 |
| Ext. hyoscyami | " | $\frac{1}{2}$ | .05 |

M. S.: One pill on retiring. This is highly recommended.

*Chordee Mixture*

| | | | |
|---|---|---|---|
| ℞ Hyoscyamin | gr. | $\frac{1}{150}$ | 0.0004 |
| Potass. bromidi | " | xv | 1.0 |
| Aq. menth. pip. | q.s. ad ʒj | | |

M. S.: One such dose on retiring. Clinic prescription and very satisfactory.

| | | | |
|---|---|---|---|
| ℞ Morph. sulph. | gr. | $\frac{1}{2}$ | .03 |
| Ext. belladonna | " | $\frac{3}{4}$ | .045 |
| Ol. theobroma | q.s. | | |

M. Ft. suppositorum unum. Sig.: To be taken on retiring. It is very efficacious.

*Triple Dose*

| | | | |
|---|---|---|---|
| ℞ Codein sulph. | gr. | $\frac{1}{4}$ | .015 |
| Chloral hydrat. | grs. | x | .6 |
| Potass. bromidi | " | xx | 1.3 |
| Aq. meth. pip. | q.s. ad ʒj | | 3.88 |

M. S.: ʒj on retiring and repeat in three hours if necessary. This is used in private practice when the preceding prescriptions have not been satisfactory. N. B. Morphin gr. $\frac{1}{8}$ can be substituted for codein and is more efficacious.

| | | | |
|---|---|---|---|
| ℞ Tr. aconite rub. | ♏ | xvj | 1.06 |
| Potass. bromidæ | ℥ss | | 15.00 |
| Pot. acetat. | ℥ss | | 15.00 |
| Inf. pareira brava | q.s. ad ℥viij | | 240.00 |

M. S.: Tablespoonful in water every two hours and afterwards until the erection subsides. This remedy is used by many urologists, but does not appeal to me.

| | | | |
|---|---|---|---|
| ℞ Tr. verat. virid. | ♏ | viij | 0.5 |
| Potas. bromid. | | | |
| Soda bicarb. | āā ℥jss | | 45.00 |
| Liq. potass. citrat. | q.s. ad ℥viij | | 240.00 |

M. S.: ʒj in water every two hours. Highly recommended.

If the chordee occurs at a certain hour, it is well to get up at this time and urinate and take another dose of the preventive. If at the same time a cloth wrung out in cold water is placed about the organ it will tend to reduce the erection. If the patient will raise the extended leg without bending the knee and hold it so that the heel is about a foot from the bed, the exertion of holding it will cause the erection to subside quickly.

Of all the remedies mentioned, I think that the hot sitz bath before retiring, the hyoscyamin and bromid mixture and the morphin, chloral hydrate and bromid mixture are the best.

Inflamed inguinal glands are painted with tincture of iodin. A piece of gauze soaked in glycerin is placed over this, then a pad of cotton batting and a spica bandage. The other complications are considered in the chapters on the individual organs or tissues involved: prostate, vesicles, testis, etc.

Local or Direct Treatment.—Whether local treatment should be begun at the earliest possible moment or whether it should be postponed until the very acute symptoms of anterior urethritis have subsided is a question upon which authorities differ. The conservative method, of which most of the older authors are exponents, consists in allowing the acme of the acute stage to pass before attempting to interfere directly with the local process. During the past fifteen years, however, especially since the introduction of the irrigation method of Janet, it has been the custom with a large number of urologists to interfere locally from the very first appearance of the disease. My own experience rather leads me not to adopt a hard and fast rule as to the time of beginning local treatment, but to be governed by the character of the attack at the time of the first visit. I think we can look at any recent attack of acute gonococcal urethritis that presents itself as consisting of one of three degrees that I have already spoken of under Symptoms.

*Hyperacute* (violent, intense, severe), when the glans is reddened and edematous, the prepuce edematous and the discharge profuse and yellow-green or puro-sanguinous.

*Simple* (*moderately acute*), when there is simply an area of redness at the end of the glans, especially about the meatus, and the discharge is profuse and yellow.

*Subacute*, when there is no congestion or edema about the glans and the discharge is not profuse, and yellow-gray, muco-purulent.

I think it is best to refrain from local interference, that is, by using urinary injections or irrigations, when the very acute symptoms are present. Local interference can, however, be safely begun in such cases as soon as the redness and swelling have somewhat subsided. Meanwhile diet, rest, internal use of alkalies and hot sitz baths should be principally relied upon.

In cases in which the acute symptoms are moderate, balsamics can be given internally in addition to the treatment just outlined; or the direct treatment by urethral injections of the silver derivatives, especially a one-quarter or one-half

per-cent solution of protargol, by means of a urethral syringe; or better, hot sitz baths and the alkalies with the balsamics can be given together with the local treatment. The same rule applies to exacerbations of a chronic process or to relapses of an acute process. In subacute cases, injections of protargol one quarter to one half per cent, or argyrol three to five per cent, can be given immediately three times a day. I am governed by the degree of the inflammation at the first visit of the patient in determining the advisability of instituting local treatment at once, or waiting until the acute symptoms have subsided and the inflammation is subacute. When a hyperacute attack becomes moderately acute, I give the moderately acute treatment outlined, and when the moderately acute becomes subacute, the subacute treatment is given. The same applies to a subacute case that becomes worse; the treatment is changed to that of the moderately acute.

The administration of the local treatment of an acute anterior urethritis consists of (1) the use of hand injections of antiseptic or astringent solutions by means of a urethral syringe by the patient at his home; or (2) irrigations of the anterior urethra with copious warm solutions by means of a suitable irrigator working by hydrostatic pressure at the physician's office; or (3) by both home and office treatment.

(1) *Hand Injections by Means of a Urethral Syringe.*—These are intended solely for the treatment of the anterior urethra. The syringe to be used for this purpose should contain two or three drachms (one quarter or one third of an ounce is the usual size) and should be made either of glass or hard rubber, with a blunt conical nozzle. The following is the mode of procedure when making such an injection: The patient, having urinated, retracts the prepuce and fills the syringe with the solution. He then inserts the nozzle of the syringe into the urethral meatus and grasps the end of the glans penis and the nozzle of the syringe by the forefinger of the left hand in such a way that it exerts equal pressure on each. The fluid is then injected slowly and evenly and without force into the canal. (See chapter on Technique of Instrumentation.) (Figs. 156 to 158, Vol. I.)

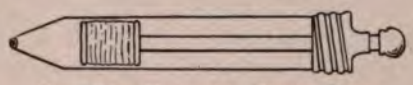


Fig. 716.—Urethral Piston Hand Syringe.

Patients should be instructed to inject enough fluid to put the urethral wall under a slight tension and, when this point is reached, the end of the meatus is compressed by the forefinger to prevent the escape of the fluid, and the syringe is removed. The solution should be retained from two to five minutes, according to its strength. The patient then releases his hold and allows the solution to escape. He may take these injections standing, sitting or lying down, as he prefers.

An important rule in the use of hand injections is that they should never cause pain, nor more than a slight burning sensation which is easily borne. In case the injections are painful, they should at once be diluted to such a degree as can be easily endured. The sensitiveness of different individuals in this

respect varies greatly. It is often advisable to give a hand injection to the patient in the office as a lesson in order to teach him how to inject. The patient should also be instructed to dilute the solution in case it causes much burning.

Hand injections should be repeated three or four times a day, using one syringeful of solution at a time, which should be held in for five minutes. During the declining stage, several syringefuls can be injected each time if desired, provided the rule regarding pain or burning be observed. The plan of giving six or eight injections daily, as is done by some, does not commend itself to me.

Hand injections may also be administered by the physician once a day in the office in cases in which it is desired to use a stronger solution than he cares to intrust to the patient.

As to the solutions used for hand injections, they may be grouped in general under two headings: The astringents and the antiseptics. A third group perhaps might be made which includes combinations of astringents and antiseptics.

In the choice of a solution to be prescribed for a hand injection one should be guided by the stage of the disease, the acuteness of the process and by the effect of particular solutions upon individual patients. The examinations of the secretion should be made from time to time in the course of an acute attack and the effect of the treatment in diminishing the number of pus cells and in causing the disappearance of gonococci should be watched. In the early stages of the acute form, affecting the anterior urethra, the antiseptics are indicated. In the last part of the declining stages, when gonococci have largely disappeared from the discharge, astringents can be given and they should be continued after the last gonococcus has vanished as long as the discharge remains.

One fact which impresses itself upon the urologist who treats many cases of urethritis is that the effect of a certain hand injection varies greatly in different patients. It is therefore necessary to modify the solution as the case progresses, either changing the strength or prescribing a solution containing different ingredients in case the former injection has lost its efficacy.

To enumerate all the drugs used at present and formerly in hand injections would not be desirable, inasmuch as but few of them are now employed by the majority of urologists. (The following list of *antiseptic solutions for hand injections* by a urethral syringe will, therefore, suffice:)

| | | |
|---|---|---|
| (1) | Boric acid | 1:30 (ʒss to oj) |
| (2) | Potassium permanganate | 1:1,000 to 1:500 |
| (3) | Mercuric bichlorid | 1:30,000 to 1:15,000 |
| (4) | Carbolic acid | 1:500 to 1:250 |
| (5) | Nitrate of silver | 1:1,000 to 1:250 |
| (6) | Sulphate of copper | 1:500 to 1:250 |

(These inhibit the growth of the gonococci and render the urethra less favorable to their propagation.)

They are now comparatively little used for hand injections. Boric acid is sometimes used in a saturated solution as a mild wash in the early part of the acute stage, as is potassium permanganate (1 : 500), although the latter is more commonly employed in copious urethral irrigations. Carbolic acid is rarely used alone, but is added as an antiseptic, at times, to astringent injections. Bichlorid of mercury is sometimes used as strong as 1 : 8,000, but in my own cases I have never been able to use it stronger than 1 : 15,000. It is rarely used as a urethral hand injection by men working in genito-urinary diseases. Sulphate of copper is also rarely used.

Silver nitrate is probably the best urinary antiseptic for general use in urology. It kills the microörganisms without injuring the mucosa. For urethral injections it can be used 1 : 1,000 to 1 : 50 if used but once a day, although 1 : 50 is very strong and should not be held in the urethra. Nitrate-of-silver injections are, however, very useful and well tolerated by the patient if used in increasing strength, by which means toleration is established. At one time in the New York Dispensary and also in the City Hospital, I used to begin treatment by injecting the patient with a solution of a grain to the ounce on the first day, increasing the strength of the solution a grain a day. In addition to this, the patient was instructed to take an astringent injection night and morning at home. At the end of ten days, the discharge had often stopped. I tried this method in several series of cases of ten each. In my first two or three series the results were surprisingly good, but later I was not so fortunate.

A 1 : 1,000 to 1 : 500 solution of silver nitrate is well tolerated by the urethra as a hand injection, whereas stronger solutions are usually employed only as instillations.

Specific antiseptics of silver derivatives are salts that are derived from nitrate of silver in different ways and they contain a varying percentage of the silver. They are protargol, argyrol, largin, albargin, argentamin, argonin and icthargon.

| Names. | Strength of Silver. | Strength of Solution Used for Hand Injections. |
|---|---|---|
| Protargol is a silver albumose, | and contains 8 per cent of silver, | $\frac{1}{4}$ to 1 per cent. |
| Argyrol is silver vitallin, | " " 30 " " | 2 " 10 " |
| Largin is silver protalbin, | " " 11 " " | $\frac{1}{4}$ " $1\frac{1}{2}$ " |
| Albargin is silver gelatin, | " " 15 " " | $\frac{1}{10}$ " $\frac{1}{8}$ " |
| Argentamin is silver phosphate, | " " 8 " " | $\frac{1}{40}$ " $\frac{1}{10}$ " |
| Argonin is silver caseinate, | " " 10 " " | $\frac{1}{10}$ per cent. |
| Icthargon is silver ichthyol, | " " 30 " " | $\frac{1}{20}$ to $\frac{1}{10}$ per cent. |

Their action is not clearly understood. It has been shown that they are very mildly germicidal, but that neither their germicidal power nor their efficacy are in proportion to the amount of silver they contain, as some of these salts which possess practically no bactericidal action produce the best results in gonococcal urethritis. They evidently inhibit the development of the gonococci by rendering the urethral soil unfavorable to their growth.

Argyrol can be used as a hand injection by means of a urethral syringe, in a strength of from three to six per cent, by the patient at home, whereas at the office it can be given by the physician at a strength of ten per cent or stronger. It also has a calming effect on a mucous surface that has been treated by a nitrate-of-silver irrigation. It should always be freshly made.

Protargol is the most useful of these derivatives as a hand injection by the urethral syringe in the strength of one quarter to one per cent of solution.

Another preparation, a mercurial derivative called mercurol, a nucleid of mercury, was used quite extensively in the clinic, but decomposed too easily to be of practical value in clinical work.

The antiseptic specific solutions, made from the silver derivatives, are injected from three to six times a day and are held in for five minutes. I have tried all these silver derivatives at the clinic and the office and have found protargol by far the most satisfactory in a 1 : 400 or a 1 : 200 solution.

*Astringent* solutions are also used as hand injections by the patient by means of a urethral hand syringe. The rule governing them is the same as applies to all other urethral hand injections.

There are two varieties of astringents used in urethral hand injections—the mineral and the vegetable. Of these, the mineral astringents are more frequently used than the vegetable, although they are often prescribed together, or one or the other may be combined with an antiseptic.

Astringents are principally used in subacute cases in the declining stage of an acute infection, or after the gonococci have disappeared from the discharge, and in chronic cases.

The principal mineral astringents, together with the strength of their solutions, used for hand injections are as follows:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Zinc permanganate.... | grs. | ¼ | to | ½ | in | water | ℥j | 1–2000 | to 1–1000 |
| Zinc acetate ..... | " | 1 | " | 4 | " | " | " | 1– 500 | " 1– 100 |
| Zinc sulphate ..... | " | 1 | " | 4 | " | " | " | 1– 500 | " 1– 100 |
| Zinc sulphocarbolate... | " | 1 | " | 4 | " | " | " | 1– 500 | " 1– 100 |
| Lead acetate..... | " | 2 | " | 8 | " | " | " | 1– 250 | " 1– 60 |
| Alum ..... | " | 1 | " | 2 | " | " | " | 1– 500 | " 1– 250 |
| Thallin sulphate ..... | " | 2 | " | 5 | " | " | " | 1– 250 | " 1– 100 |
| Bismuth subcarbonate . | " | 2 | " | 40 | " | " | " | 1– 250 | " 1– 10 |

The most reliable mineral astringents have always been, and are at present, the zinc salts, especially the sulphate and the acetate. The lead acetate is also a popular astringent and is frequently combined with the zinc salts, as is alum.

The vegetable astringents are less efficacious and consequently less used. They are generally employed in combination with the mineral astringents. They are:

| | |
|---|---|
| Tannic acid | 1:300 to 1:200 |
| Ext. hydrastis fld. (colorless, Lloyd) | 1:8 to 1:6 |
| Tinc. catechu | 1:30 to 1:20 |
| Ext. krameriæ alcohol | 1:200 to 1:100 |

These various astringents may be used singly in solution as an astringent injection. They are, however, generally used in combinations, the minerals alone, or the mineral and vegetable, or the mineral and antiseptic.

| | | |
|---|---|---|
| ℞ Zinc. sulphate | grs. v | 0.25 |
| Aquæ | ℥iv | 120.00 |

M. S.: Inject locally.

| | | |
|---|---|---|
| ℞ Zinc. sulphocarbolate | grs. xvj | 1.06 |
| Glycerini | ℥ss | 15.00 |
| Aquæ rosæ | q.s. ad ℥iv | 120.00 |

M. Sig.: Inject three times a day and hold in for five minutes.

| | | |
|---|---|---|
| ℞ Zinc. sulph. | | |
| Alum. | āā gr. j | 0.06 |
| Glycerin | ʒj | 3.88 |
| Aq. rosæ | q.s. ad ℥j | 30.00 |

M. S.: Inject. Note: One of the best mineral astringent injections.

| | | |
|---|---|---|
| ℞ Zinc. sulph. | grs. v | 0.25 |
| Pb. acetat. | grs. viij | 0.25 |
| Aq. rosæ | q.s. ad ℥iv | 120.00 |

M. S.: Inject. Note: Another of the best mild mineral astringent injections.

*Purely vegetable astringent injections are not as commonly used as those that are purely mineral.*

| | | |
|---|---|---|
| ℞ Hydrastin. muriat. | grs. x | 0.66 |
| Ext. hamamelis | ʒij | 7.76 |
| Glycerin | ℥ss | 15.00 |
| Aq. dest. | q.s. ad ℥iv | 120.00 |

M. S.: Inject. Note: A good vegetable astringent injection.

We will now consider the mixed mineral and vegetable astringents which are far better than the purely vegetable mixtures, although not superior to, or perhaps not as good as, the purely mineral solutions.

| | | | |
|---|---|---|---|
| ℞ Zinc. sulph. (or acetat.) | | grs. xij | 0.72 |
| Morph. sulph. | | grs. x | 0.66 |
| Glycerin. | | ℥j | 30.00 |
| Aq. rosæ | | ℥iij | 90.00 |

M. S.: Inject. Note: Rather a strong injection that can only be used in the last stages of an acute process.

| | | | |
|---|---|---|---|
| ℞ Hydrastinin hydrochlorid | | | |
| Zinc. acetat. | āā | grs. viij | 0.48 |
| Glycerin. | | ℥j | 30.00 |
| Aq. rosæ | q.s. ad | ℥iv | 120.00 |

M. S.: Inject. Note: Highly spoken of, but never used by me.

| | | | |
|---|---|---|---|
| ℞ Zinc. sulph. | | grs. ij | 0.12 |
| Fl. ext. hydrastis (Lloyd, colorless) | | ʒj | 3.82 |
| Aq. rosæ | q.s. ad | ℥j | 30.00 |

M. S.: Inject. Note: Probably the best of the combined mineral and vegetable astringents.

| | | | |
|---|---|---|---|
| ℞ Zinc. sulph. (or acetat.) | | | |
| Acid tannic | āā | grs. ij | 0.12 |
| Aq. rosæ | q.s. ad | ℥j | 30.00 |

M. S.: Inject. Note: Very good; but not one of my favorites.

| | | | |
|---|---|---|---|
| ℞ Zinc. sulph. | | grs. ijss | .15 |
| Lead acetat. | | grs. iijss | .20 |
| Tinct. opii | | | |
| Tinct. catechu | āā | gtts. xx | 1.33 |
| Aquæ dest. | q.s. ad | ℥j | 30.00 |

M. S.: Inject. Note: Very efficacious. It is generally used by me after the more simple preparations have failed. It resembles the old Injection Bru.

| | | | |
|---|---|---|---|
| ℞ Ext. hydrastis fld. (colorless) | | ʒvj | 23.28 |
| Bismuth subcarb. | | ʒvj | 23.28 |
| Boro-glycerid. (25 per cent) | | ʒvj | 23.28 |
| Aq. destil. | q.s. ad | ℥vj | 180.00 |

M. S.: Inject after urination. Very popular with some of my colleagues.

The mixed astringent and antiseptic solution:

| | | |
|---|---|---|
| ℞ Zinc. sulph. ..... | | |
| Acid carbolic ..... | | |
| Alum. ..... | āā gr. j | 0.06 |
| Glycerin. ..... | ʒj | 3.88 |
| Aquæ destil. ..... | q.s. ad ℥j | 30.00 |

M. S.: Inject. I consider it the best of all the astringent injections.

There are other solutions that are used more as soothing than curative injections: such as sol. cocain hydrochlorat, 2 per cent.

*Note.*—Glycerin is of value in injections, as it gives them a better body, besides reducing the inflammation.

The above combinations and mixtures are either used in my private practice and clinic work, or else are highly recommended by some of the best authorities on the subject.

(2) *Irrigations of the Urethra.*—"Urethral irrigations" and "washes" are synonymous. They simply mean that a solution is allowed to run into the urethra and out again, either by means of hydrostatic pressure coming from a fountain syringe, or gently injected by means of a large six-ounce piston syringe. The solutions are of permanganate of potash or nitrate of silver usually.

If it is considered advisable, the fluid can be made to flow through the urethra into the bladder, preferably by hydrostatic pressure, after which it is voided. Sometimes a catheter or some other hollow tube is used for an anterior irrigation, in which case it is passed down to the bulb of the urethra and the solution is allowed to run through the instrument and escape by its side. In case the bladder is to be irrigated by catheter, it is passed into this organ, and the fluid is injected into it. When the bladder is full, the solution is either allowed to escape through it or the patient voids the solution.

*Urethro-vesical Irrigations: Janet Method.*—When this method of treating urethritis was first described by Janet and his followers, about fifteen years ago, and the surprising cures reported, there was some confusion in the minds of the profession as to what it comprised. Judging from the questions of my Post-Graduate students at that time, some thought it meant the irrigator, others the shut-off and nozzle, others his manner of irrigating the urethra and still others the discovery that the compressor-urethræ muscle could be overcome by hydrostatic pressure, thus allowing the solution to enter the bladder. It is also not clear to everyone to-day what this method really consisted of.

For the sake of unraveling the tangle that still exists in the minds of many, I will say that an irrigator and a fountain syringe are practically the same, that is, a reservoir which holds the solution and a piece of rubber tub-

ing attached through which it runs out. Also that valves, nozzles, the use of permanganate of potash and other solutions in the urethra for injections and irrigations were all known to the profession before Janet's time; as well as the fact that a solution, influenced by hydrostatic pressure, or any other variety of pressure if it be sufficiently strong, causes the cut-off muscle to yield and the liquid then runs into the bladder.

What, then, was the Janet method? It was simply advocating the use of permanganate-of-potash solution of certain strengths for urethral irrigation in certain cases, as well as sufficient hydrostatic pressure by means of elevating the reservoir of a fountain syringe to have the fluid pass through both the anterior and posterior urethra into the bladder, when such a procedure was indicated, after which it was voided by the patient.

There were certain details and refinements associated with the administration of irrigations in his hands, due to carefully studying the subject and observing the effects of different changes in technique which made Janet a master of the method. Many have decried his ideas without having given them fair trial. Janet never claimed to cure all cases in a certain time, but to cure a certain proportion of them. In their first writings on the subject, Janet's followers were evidently overenthusiastic, as they well might have been, in the hope of having discovered a means of quickly curing gonorrhea which for centuries had baffled the efforts of the best men interested in the subject.

We will, therefore, consider certain of the instructions given by Janet for carrying out his method and what he claimed for it. Many of these have since been modified by himself and others.

When to Irrigate; Preparations.—Janet said that irrigations should be given either for the purpose of aborting an acute urethritis at its beginning, or else they should be used in a conservative way by commencing on the fifth day, or after the acute stage had passed.

The permangante-of-potash solution varied in strength from 1:10,000 to 1:1,000. Janet formerly used it stronger, but he later found weaker solutions just as efficient and less apt to cause complications.. Nothing stronger than 1:1,000 was allowed to go into the posterior urethra and bladder. Usually 1:4,000 was used at the beginning and the solution was usually increased as follows: 1:4,000, 1:3,500, 1:3,000, 1:2,500; 1:2,000, 1:1,500, 1:1,000 and even 1:500, although the last strength should be used only in the anterior urethra.

For anterior irrigations, the bottom of the irrigating jar is from two to three feet above the patient's pubes. The regulation of the amount of pressure employed in irrigating the anterior urethra is indeed a matter of considerable practice, and beginners are much more apt to err in using too much than in using too little. The temperature of the solution is from 105° to 130° F.

The patient sits on a douche pan on a table with a movable back in a semi-

reclining posture; or else he sits in a chair leaning back in such a way that he rests on the sacrum, in which case he has a piece of rubber sheeting over his lower extremities.

The technique of irrigation is as follows: The physician stands or sits at the right side of the patient. He holds the penis with the left hand, while with the right he regulates the cut-off valve of the irrigating apparatus. A small amount of fluid is then allowed to run out in order to remove any air bubbles or the remains of fluids from previous irrigations. The stream is next allowed to play upon the glans and the urethral orifice. The penis is then held with the left hand in such a manner that the tips of the fingers surround the wall of the anterior urethra the index finger and thumb being immediately behind the corona of the glans, while the other fingers cover the canal down to the peno-scrotal junction. The tip of the irrigating nozzle is next introduced into the meatus and the fingers are gradually relaxed, allowing the anterior urethra to be filled. The tip is then slightly withdrawn, without actually removing it from the meatus, and the stream of fluid escapes. This procedure is repeated several times. The nozzle is then removed and the last three fingers of the right hand press from below upward upon the perineum so as to remove any fluid that may have collected in the bulb. The irrigation is continued in this way until the irrigator is emptied, a period of from five to ten minutes. It is essential to secure a sufficient amount of distention of the anterior urethra every time the fluid enters. The instant the maximum distention has been reached, the tip must be withdrawn or the grip on the organ relaxed, otherwise the fluid may pass into the bladder. When it is considered necessary to irrigate the posterior urethra as well, the irrigator is raised four or five feet above the pubes in order to have the fluid overcome the compressor-urethræ muscle and enter the posterior urethra and bladder. The solution is then not allowed to escape by the side of the nozzle, but when the anterior urethra is full the patient is told to breathe deeply, and try to urinate. This tends to relax the cut-off muscle and allow the fluid to enter the posterior urethra and the bladder. More solution is then allowed to flow into the urethra, and the sensation of filling and relaxing is experienced by the practitioner until the bladder is full.

Sometimes the fluid flows in for a short time and then stops through contraction of the cut-off muscle; then the urethra dilates and some of the fluid is forced back into the tubing. The pressure of the fluid is then diminished by closing the valve and withdrawing the nozzle slightly to allow some of the solution to escape. The instruction to relax, breathe deeply and try to urinate should be again repeated and the solution once more continues to flow into the posterior urethra and bladder until the bladder feels full, when the patient is directed to void. In this way the urethra is dilated and the urethral follicles found just inside the meatus are flushed out and disinfected.

In case the fluid does not flow into the bladder when these irrigations are first attempted, no effort to force the fluid in should be resorted to, but another trial should be made on the following day.

Cocain was often used by Janet as preparatory treatment to an irrigation, 5 c.c. of a one-quarter-per-cent solution being injected into the anterior urethra and retained for a minute.

Frequency of Irrigation.—During the first few days that irrigation is employed in an acute case, the anterior urethra alone is irrigated twice daily. When the posterior urethra becomes affected—and it usually does, as is shown by the second urine being turbid—the irrigation of the antero-posterior urethra is given twice daily. This usually occurs in about ten days or in the second week of the attack. When the cloudiness of the second urine clears up, the antero-posterior irrigations are suspended and the anterior irrigations are alone continued. When the diffuse cloudiness of the first urine disappears, the anterior irrigation is given but once a day. I stop the irrigation when the urine no longer contains pus or gonococci, and I put the patient on an astringent injection. It is advisable after the discharge has stopped, if there are mucous and epithelial shreds in the urine, to give an irrigation every other day for a week and one every third day for another week, besides the astringent injections.

The result of permanganate irrigations, gauged by their effect on the discharge as well as on the urine, is as follows: For the first few hours after the irrigation there is a white secretion, composed of a clear serum which is sometimes slightly blood-stained. This is called the dry stage. Later in the day there is usually a reappearance of the purulent discharge with the gonococci, which marks the wet stage. The irrigation is then given again. This renders it necessary for the first week or ten days to give it twice a day. When the dry stage becomes more prolonged and the wet stage appears only once a day, but one daily irrigation is given. The duration of the dry stage continues to increase, and the gonococci are absent from the discharge for a longer period until finally there is no return of the wet stage and the patient is cured. The treatment can then be discontinued, or else astringent hand injections are given for a few days.

The action of permanganate of potash is to cause a slight edema of the urethra which influences this culture ground in such a way that the microbes cease to develop. If this condition can be kept up long enough, it results in their complete destruction. While this edema lasts, no microbes can be found in the discharge.

The advantage of irrigations is to lessen quickly the burning on urination, the severity of the chordee and the liability to complications. The disadvantages are the length of time required for the treatment, the difficult technique and the pain and tenesmus that often follow the irrigation; also an increase in prostatic and seminal vesicle complications.

The duration of the trouble is usually three or four weeks, although the patient may apparently be well in eight days.

Recurrence takes place in twenty per cent of the cases in about five days, in which case the irrigations are begun again and continued for from six to eight days longer. When the treatment with the permanganate of potash fails and the discharge persists, irrigations with nitrate-of-silver solution, varying in strength from 1:4,000 to 1:2,000, should be resorted to.

In commenting on the Janet method, I can say that I have never found it necessary to use cocain injections preliminary to irrigations. The Janet method in anterior urethritis is the same as was used here in 1886 by Curtis, Vanderpoel and Brewer, except that in cases in which posterior urethritis is present, as it is in at least ninety per cent of the cases, the irrigator is raised sufficiently high to allow the fluid to enter the posterior urethra and bladder; whereas in 1886 the anterior urethra alone was irrigated, and salt solution or bichlorid solution was used instead of permanganate. Permanganate-of-potash solutions are valuable in the treatment of acute attacks or in an acute exacerbation of chronic cases.

Personally, I do not employ permanganate solution, save in those acute cases of moderate severity or of the subacute form, in which the patient has special reasons for hurrying the disappearance of the discharge and requests quick treatment. In such cases, daily irrigations with permanganate solution are given once or twice a day in the manner described by Janet and offer a means of shortening the attack.

In employing this method, however, the fact should be borne in mind, that complications at times occur as the result of this treatment in acute cases, the most common of which are prostatitis, vesiculitis and epididymitis. To avoid such complications, the practitioner must abstain from irrigating acute cases with severe inflammatory symptoms, until they have subsided. He must also be careful not to employ too much hydrostatic pressure in irrigating the anterior urethra in a case in which the posterior is not involved.

Since Janet's first writings, the ideas of the profession have changed considerably in regard to the value of permanganate irrigations in urethritis and many have given up the use of permanganate, especially as advocated by him, and have taken up the treatment with the new silver preparations. It seems to me but natural that men doing urethral work should vary in judging the value of irrigations, as well as the methods of administering them and the solutions to be used.

Personally, I never give irrigations at the beginning of an acute attack of gonococcal urethritis; and even when the attack is subacute and I give local urethral treatment, I prefer injections of the new silver derivatives, especially protargol, before beginning irrigations.

*Silver Solutions.*—In treating gonococcal urethritis in the hospital, clinic and office, I have generally used the nitrate of silver, and when, in 1886 and 1887, they were using bichlorid irrigations of the anterior urethra in Roosevelt Hospital, I began to use irrigations of nitrate of silver in the City Hospital as well as injections of silver nitrate by the hand syringe.

I think that, in routine cases, nitrate-of-silver solutions employed every other day, beginning with a weak solution and gradually increasing the strength, are much better than irrigations of permanganate of potash, and I continue to use nitrate of silver in spite of the fact that the newer silver salts have been employed by many in the irrigation treatment. After having tried all the newer silver preparations in the treatment of a very large number of cases in the clinic at the Post-Graduate Hospital, we have returned to silver nitrate for irrigation, and the results obtained with this drug compare most favorably with those recorded with the newer and more expensive preparations. One of the reasons for using nitrate-of-silver solution in the clinic instead of permanganate of potash has probably been because it is more effective for every-other-day irrigations than permanganate of potash. Unfortunately our clinic is held but three days in the week.

The solutions of silver nitrate which I employ begin at a strength of 1:16,000 and gradually increase to 1:2,000, the latter solution being as strong as I generally employ for irrigations, although I sometimes give 1:1,000 or even stronger. The solutions are prepared with hot distilled water at from 110° to 130° F., the amount used being one liter for each irrigation. A stock solution of one-hundred-per-cent silver nitrate is kept on hand, of which each drop represents one grain of the salt. One drop of this solution in a quart of water makes approximately a solution of 1:16,000, and the strength may be thus regulated by adding successive drops up to eight drops, which gives a solution of 1:2,000.

In acute cases, I formerly began with irrigations of 1:16,000 solution. When the discharge began to subside, the strength was gradually increased to 1:8,000 and stronger. In subacute cases, the strength in the beginning is 1:8,000, which strength I continue to increase to 1:7,000, 1:6,500, 1:6,000, 1:5,500, 1:5,000, 1:4,500, 1:4,000, 1:3,500, 1:3,000, to 1:2,000 in case the discharge continues. I also have the patient take hand injections of astringent solutions, three times a day, at home.

The solution, in all cases in which posterior urethritis is present, is allowed to go into the bladder and is urinated out again when the bladder is full. I have had almost no cases of epididymitis by this treatment, but quite a number of prostatitis, although but two of my private cases in a number of years have had to be operated on for prostatic abscess. The amount of time required for the cure of an acute attack with silver solutions is about six weeks. This is approximately the time in which potassium-permanganate solutions effect a cure.

*Catheter irrigations of the urethra* are also made by means of catheters passed into the anterior urethra or bladder and attached to the irrigating apparatus. In cases of anterior urethritis, a soft-rubber catheter is passed down to the bulb, a short, sharp coupling nozzle is attached to the cut-off and the solution allowed to run into the bulb of the urethra through the catheter and then to escape by its side. In the case of posterior urethritis, the end of the catheter can be pushed into the posterior urethra and it can also be irrigated, in which case the solution does not escape beside the catheter but flows into the bladder (see Fig. 588); or the catheter can be introduced directly into the bladder and that organ can be filled and the solution injected can be passed out through the urethra after the withdrawal of the catheter. Some prefer washing out the urethra through a catheter by means of a large piston syringe instead of hydrostatic pressure, but I do not consider it a good method.

In the subacute stage of urethritis, I sometimes irrigate the anterior urethra by means of a hard-rubber nozzle with an olive-shaped tip that I attach to the cut-off and pass into the fossa navicularis. This has proved satisfactory and has never caused any traumatism of the canal. In giving anterior irrigations, I sometimes pass a hard-rubber nozzle, six inches long, to the bulb of the urethra. This instrument has an opening in the end for forward irrigation and also several at the base of the olive bulb for retro-irrigations. It has the advantage over soft-rubber catheters in that it can be fitted to the irrigating apparatus and better controlled. With the catheter and the above-mentioned instrument, I use silver solutions. These hard-rubber nozzles are better adapted to cases of chronic urethritis than of acute.

**Treatment of Acute Posterior Urethritis.**—When acute posterior urethritis occurs during an acute gonorrhea, I usually stop all urethral injections; but if I am treating the patient by the Janet method, I give urethro-bladder irrigations as just outlined unless the posterior urethritis is very acute. I am influenced, however, by the degree of suffering and by the tolerance of the patient to permit irrigation. If the attack has been quite acute, as soon as the symptoms have subsided, the *local treatment* by hand injections and by posterior instillations or by urethro-bladder irrigations of permanganate or silver nitrate can be returned to. Instillating solutions of silver nitrate varying from 1 : 500 to 1 : 50 are made into the posterior urethra. Instillations of the solutions of the other organic silver compounds may also be given in a strength five times as great as in the case of urethral hand injections. Instillations into the posterior urethra are usually made with an Ultzmann syringe, the amount injected being from fifteen to twenty drops. The technique of instillations has already been given in detail under the heading of The Technique of Urethral Instrumentation (page 175, Vol. I).

Irrigations of the posterior urethra with the aid of a large piston syringe to which is attached a soft-rubber catheter are employed by some, as well as

irrigations by means of a Guyon instillator. Such instillations or irrigations should be repeated about three times a week and should be interrupted at once if followed by the slightest exacerbation in the symptoms. I do not find them as useful, however, as instillations by the Ultzmann syringe. The solutions used in urethro-vesical irrigations by hydrostatic pressure or bladder fillings through a catheter should be voided immediately afterwards.

The *internal treatment* of acute posterior urethritis is specific and palliative. The specific remedy usually employed is the sandalwood-oil emulsion already referred to, but in addition to this is added tincture of belladonna as an antispasmodic. The mixture is made as follows:

| | | | |
|---|---|---|---|
| ℞ Tinct. belladonna | ʒij | 8.00 |
| Ol. santal | ℥ss | 16.00 |
| Potass. citrat. | ℥ss | 16.00 |
| Mucil. acaciæ | | |
| Syrup. simplicis | | |
| Aq. menth. pip. | āā ad ℥iv | 120.00 |

M. Sig.: ʒij t.i.d. after meals.

In addition to this, the patient should take hot sitz baths twice a day for ten minutes each time.

Sometimes the patient is placed upon a milk-and-Vichy diet for a few days.

The frequency of urination is sometimes so marked and is accompanied by so much pain and tenesmus, that it is necessary to give the following antispasmodic mixture.

| | | |
|---|---|---|
| ℞ Morphin | gr. ⅛, or codeia gr. ½ | 0.008 or 0.03 |
| Chloral hydrat. | grs. vijss | 0.5 |
| Potass. bromidi | grs. xv | 1.0 |
| Aq. menth. pip. | q.s. ad ʒj | 4. |

M. Sig.: One such dose every four hours if necessary.

### Treatment of Chronic Urethritis

The treatment of chronic urethritis is (1) hygienic, (2) supportive, (3) symptomatic and (4) radical.

Chronic urethritis is the result of anterior urethritis. This may have been very acute and have then subsided into a subacute and chronic condition; or it may have been subacute from the first and have lapsed into a chronic state. There are certain predisposing causes to chronicity in acute urethritis: First, an indulgence in excesses of drinking and coitus; second, a natural obstruction, such as a narrow meatus or a congenital stricture, or else an acquired stricture, the result of a previous attack. The various methods of examination, already

outlined, will enlighten us as to whether the inflammation is anterior or posterior, and if anterior, whether there are strictures present or whether it is due to local lesions of an inflammatory nature (pages 359 to 361).

(1) **Hygienic Treatment.**—Hygienic treatment is the first taken up and the patient is instructed how to live. The diet is simple but nourishing, as is indicated under Acute Urethritis. No liquor, beer, ale or champagne should be indulged in; but a little red wine may be allowed if it does not cause an increase in the discharge. Sexual intercourse should be forbidden. If indulged in, contrary to orders, a condom should be worn and the woman informed of the condition.

Exercise should be taken. Moderate walking, swimming, golf and slow gymnastics with pulley weights are the best, as prescribed in the chapter on Exercise. They tend to increase the general circulation, to draw the blood away from the genito-urinary organs and to improve the physical condition.

(2) **Supportive Treatment.**—In many chronic cases, the patient's general condition suffers and he becomes nervous and neurasthenic. This is particularly the case when a chronic posterior urethritis is present, either alone or associated with chronic prostatitis. In such cases, tonics are of importance, as strychnin, iron and small doses of quinin. Basham's Mixture (Mist. ferri et ammon. acetate) is also excellent. The use of the high-frequency current is beneficial.

(3) **Symptomatic Treatment.**—For an Acute Exacerbation.—Internal specifics, such as copaiba, ol. santal, cubebs, kava-kava and buchu, can be used in the same way as for an acute attack. The symptomatic treatment is principally of a local nature. The discharge occupies the mind of the practitioner as well as the patient, and his aim is to stop it by whatever safe means he can employ. In many cases the discharge is kept up by overtreatment, and it is difficult for some physicians to understand that better results are obtained by treatment in moderation than by too vigorous measures.

For a subacute discharge with gonococci, an antiseptic injection should be given of protargol one quarter to one per cent, or of argyrol two to six per cent, three or four times a day, by means of a hand urethral syringe. The protargol is preferable. When the gonococci have disappeared, a mild astringent injection, such as has been mentioned under The Treatment of Anterior Urethritis, can be given. The one principally used by me is:

℞ Acid. carbol. .....
Zinc. sulph. .....
Alum .....āā gr. j;
Glycerin ..... ℥j;
Aq. destillat. .....q. s. ad ℥j.

M. S.: Inject three times a day.

STRICTURES.—When strictures are present in the anterior urethra, they should either be dilated by sounds or dilators to the size of the remainder of the canal, or else cut.

*Dilatations.*—Formerly the lubricants of the sounds were medicated and cupped sounds were constructed to better carry the lubricant.

Ointments and oils are still used on sounds of the ordinary type, in quite as efficient a way as if cupped sounds were employed.

The ointments recommended are:

| | | | |
|---|---|---|---|
| ℞ | Ol. theobromæ | ℥j | 30. |
| | Ceræ flavæ | grs. x | 0.66 |
| | Argenti nitrati | grs. v | 0.33 |
| | Balsam Peru | grs. x | 0.66 |

M. S.: Melt and smear on a sound. Note: The heat of the urethra will melt it.

Another ointment is:

| | | | |
|---|---|---|---|
| ℞ | Creolin | ♏ x to ♏ xv | 1.0 |
| | Lanolin | ℥j | 30.0 |
| | Ol. olive | ℥ss | 15.0 |

M. S.: Smear on sound.

Such lubricants are not used by many to-day. Boro-glycerid is, however, still popular. Gomenol is probably the most popular medicated lubricant, in a strength of twenty per cent in olive oil, and we constantly use it in office work. Glycerin is the lubricant most frequently employed, as it mixes readily with water and thus allows the solutions to medicate thoroughly the urethral wall.

Dilatation followed by the washing of the canal with antiseptic and astringent solutions is, however, the most effective method of treating cases of chronic urethritis, depending upon urethral narrowings. Each dilatation is followed by an irrigation by hydrostatic pressure, or by means of a catheter, with a solution of silver nitrate 1:8,000 to 1:1,500, the strength of the solution to be gradually increased. If the stricture is a narrow one, an Oberländer or a Kollmann dilator can first be used, and later sounds.

When the anterior part of the urethra alone is dilated, an irrigation of the anterior urethra only is indicated; but if the dilator is one that dilates both the anterior and posterior portions of the canal at the same time, an irrigation of the entire canal by hydrostatic pressure or by catheter is given. The irrigating Kollmann dilator is an excellent instrument to use in these cases, as the stricture can be dilated first and then the douche current turned on and the urethra irrigated without removing the instrument. The dilatation by whatever

means should be from one to two millimeters at each treatment, depending on the resistance of the stricture. (See Fig. 180, Vol. I.)

Instead of using hydrostatic pressure, I sometimes use a catheter wash. I pass the catheter as far as the bulb and give an anterior irrigation; or else into the bladder, which I fill, after which I allow the patient to void, thus washing out the entire urethra. When strictures do not dilate, it is advisable to cut them in order to obtain a cure of the urethritis. Chronic urethritis is usually very subacute; but a constant profuse and purulent discharge of a moderately acute character sometimes exists for months in cases of urethral strictures, usually of a small caliber, which cannot be brought to the condition known as "gleet" either by the use of astringents or antiseptic injections or irrigations. In these cases, dilatation only aggravates the discharge and predisposes to complications. Such cases are very rare, and after trying various methods of treatment, I have been obliged to perform urethrotomy and later give astringent injections, pass sounds and irrigate with silver nitrate before obtaining a cure.

One of the greatest predisposing causes to chronic urethritis is a congenital narrowing of the meatus, or a linear congenital stricture just in front of or behind the fossa navicularis. At the meatus it may be simply membranous or of the size of a linear stricture, or in other cases a thickening of the tissue of the glans.

The irritation brought on the urethra by the sudden partial checking of the stream, when the urine strikes the narrowed portions, exerts a harmful influence on the chronic area of inflammation behind it, and also on the posterior urethra. These areas of inflammation in the anterior urethra are usually in the fossa navicularis just behind the fossa, at the peno-scrotal junction and in the bulbous portion of the canal.

If a chronic urethritis is obstinate in such cases, a *meatotomy* should be performed. The strictured band is brought into view by means of a urethral speculum and is then severed by a knife with a narrow blade up to the size No. 32 French. The remainder of the anterior portion of the canal is then examined with bougies à boule to see if any other narrowings exist that were not detected before the cutting of the impediment at the end of the canal. Certain parts of the tract may be found to be narrower, although these narrowings may not be, strictly speaking, strictures, but irregular thickenings of the mucous membrane of the canal, such as granular patches with a slight exudate beneath them or else an infiltration about certain urethral glands or follicles that are chronically inflamed. These localized areas of infiltration differ in consistency, but usually produce a narrowing of the canal and later a stricture. For years before the pathology of the urethra was understood, dilatation was employed in the treatment of chronic urethritis. The effect of dilatation is to cause absorption of infiltrates and prevent stricture formation. The passing of sounds two or three times a week, increasing each time if possible one

or two sizes according to French numbers until 30 or 32 has been reached, will in such cases cause an absorption of these infiltrates and open the mouths of the urethral glands and follicles. (See Plates of urethroscopic conditions, Vol. I.)

*Dilators.*—In infiltrates of but moderate density, the Oberländer and Kollmann dilators are perhaps more valuable than sounds. The Oberländer dilator and one form of Kollmann dilate the entire urethra and are the instruments recommended. Both the Oberländer and Kollmann dilators are introduced with rubber covers to prevent their blades from cutting the urethral tissues. (See Figs., Dilators with Covers, 182 and 183, Vol. I.)

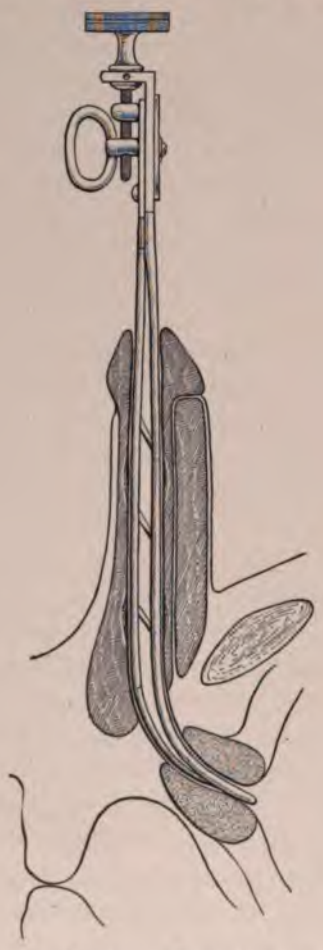


Fig. 717.—Urethral Dilation with the Oberländer.

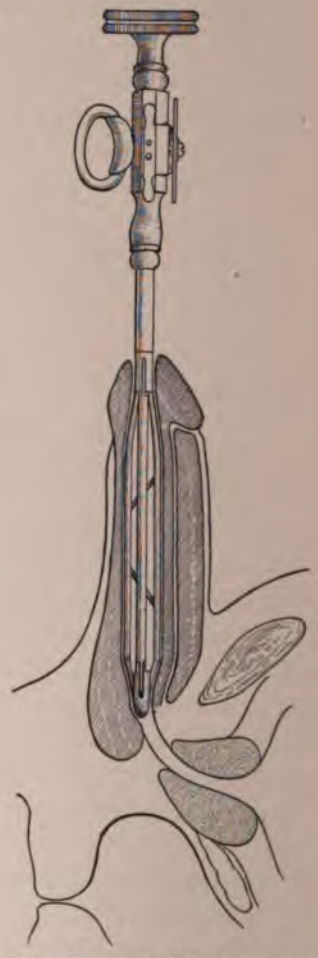


Fig. 718.—Urethral Dilation with the Straight Kollmann.

*The Dilatation.*—When sounds or dilators are passed, the patient should be on the table in a reclining posture, with his head and shoulders elevated at an

angle of 45° with the table. The Oberländer dilator, which has but two blades, can be passed through a stricture which will admit a No. 16 French sound, and can dilate the canal to 40 French, whereas the Kollmann dilator, which has four blades, can only be passed through a stricture of 23 to 25 French, but can be dilated to 50 French.

The Oberländer dilator is generally used only for cases with a stricture of medium size, whereas the Kollmann is used for strictures of large caliber above 23 French, and also for the soft infiltrates already spoken of. It will thus be seen that in using urethral dilators, the treatment by the Oberländer dilator may be only preliminary to that by the Kollmann. In cases of chronic urethritis of the pendulous urethra, it is better to use the straight Kollmann dilator, especially if the posterior urethra is sensitive. The irrigating Kollmann is, however, the one I prefer, as the instrument is so constructed that the dilating bands do not catch the urethral walls and therefore it is not necessary to use it with a rubber sheath. The solution can thus spurt out of the irrigating apparatus into the urethra.

The Kollmann, as well as the Oberländer dilator, is passed in the same way as a sound, glycerin or some soluble lubricant being used. After it has entered, the screw at the end of the handle is gently turned and the operator watches the dial to detect the number representing the size of the dilatation. When there is any pain or a pronounced feeling of tension, the dilatation is discontinued, as otherwise it would harm the patient. The duration of the dilatation is from ten to fifteen minutes. The stretching should be slow and the wheel slightly turned every two or three minutes, instead of being immediately brought to a full dilatation.

Dilatation performed carefully produces a mild inflammatory reaction, which leads to absorption of the infiltrates and secures the evacuation of the glands and the emptying of their inflammatory contents. The healing process is due to minute longitudinal lacerations in the infiltrated area, which stretch out and make it thinner and facilitate absorption; whereas, if the dilatations were too vigorous, the traumatism might be dangerous. In case an exacerbation associated with an acute discharge should take place, the treatment should be discontinued temporarily.

It can be said of urethral infiltrates that the soft variety usually accompanies a chronic urethritis of short standing and that it is rare to find a profuse discharge with the hard infiltrates such as are present when the disease is of long standing. Irrigations of silver solution (1:5,000 to 1:2,000) by hydrostatic pressure should follow each stretching in case the instrument is of the irrigating variety. Otherwise, the covered instrument is removed and an irrigation is given in the ordinary way as after passing a sound.

Hypospadias, when limited to the glans, is called balanic hypospadias. It is a mild deformity, but it often causes a narrowing of the canal on account

of the fibrous bands associated with it. Here again the narrowing must be overcome by nicking the bands with the knife and dilating the urethral opening. The same treatment is given as for strictures and a narrow meatus.

Other steps should be taken in the case of a narrowing of the urethra due to the presence of local exudates and soft strictures, after this condition has been overcome by dilatation; or in case of hard strictures after they have been brought to the normal size of the urethra by dilatation or cutting, and further treatment by the passage of sounds and irrigations has been practiced for some time without avail. Curettage of the urethra and various electric treatments, such as high-frequency currents through a urethral electrode, are to my mind of no great value, and it is advisable to treat directly through the urethroscope. I do not mean to say that up to this time the urethroscope should not be used for any purpose. On the contrary, no urethral examination is complete unless this instrument has been used, and, in case at the time of the first examination the inflammation is sufficiently acute to contraindicate its introduction, urethroscopy should be performed as soon as the inflammation has subsided enough to permit its use, provided that the urethra is sufficiently large to allow its introduction.

*Urethroscopic Treatment.*—The larger the urethra, the better the view that can be obtained and the more space there is for manipulation through the urethroscope. In performing urethroscopy, the tube is more liable to catch at the meatus than at any other point of the canal and it is sometimes difficult to introduce a No. 28 French urethroscope into a canal that will take a No. 30 French sound. A No. 28 French urethroscope affords sufficient space for urethral treatment, but a No. 30 French is much more satisfactory, whereas, on the other hand, a No. 26 French gives but little room after the lighting apparatus has been introduced.

It is needless to say that, in introducing a urethroscope with the object of making local applications to the urethra, no oily substance should be used as a lubricant. Glycerin is the best for this purpose.

The patient is brought into position with the body in a reclining posture, the buttocks near the edge of the table and the feet in inverted stirrups. The electric controller or the battery is at the right of the operator and the urethroscopic tubes, lamps, applicators, cotton, solutions and whatever else he intends to use are on a table beside him.

The urethroscope with its obturator is dipped in glycerin and is introduced to the bulb; the obturator is then withdrawn and the urethra is cleaned out with a swab. The lamp carrier, having the lamp on the end, is then slipped into the tube and the electric current is turned on, illuminating the urethral field.

The urethra at the end of the tube will appear as a round area of mucous membrane, in the center of which will be a depression from which central point

lines radiate toward the periphery like the spokes of a wheel. The urethroscopic tube is then withdrawn slowly and pathological areas are looked for along its wall. These may be (1) localized areas of inflammation, showing themselves as red areas darker than the surrounding tissues; (2) granular patches, slightly elevated; (3) erosions, small ulcerations; (4) papillomatous growths; or (5) polyps. There may also be seen the mouths of dilated urethral glands or follicles which are affected by the chronic urethral process.

FIG. 719.—PATIENT ON TABLE WITH INVERTED STIRRUPS, CONTROLLER, LAMPS, CORDS, COTTON, SOLUTIONS, APPLICATORS, ETC.

As the urethroscope is withdrawn, the urethra should be swabbed out from time to time, as an accumulation of glycerin lubricant might otherwise obscure the field of vision. (See Plates in Vol. I showing urethral pathological conditions as seen by the urethroscope.)

The treatment of the above condition is as follows: Localized areas of inflammation can be treated by a local application of silver-nitrate solution, beginning with one half of one per cent and increasing the strength according to the amount of reaction produced. The applicators used for this purpose are from eight to ten inches long, with the distal end three or four millimeters in diameter. The amount of cotton used at the end varies with the size of the area to be treated and the degree of thickening. The strength of the solution also depends on the character of the lesion. An applicator with a fairly thick piece of cotton wound around the end is called a swab. For localized areas of inflammation with but slight thickening, the diameter of the swab is from ten to twelve millimeters, and the strength of the solution is from one to two per cent; for granular patches, the diameter of the swab is from eight to nine

millimeters and the strength of the solution two to five per cent; for erosions and ulcerations, the diameter of the swab would be from six to eight millimeters and the solution five to ten per cent. The way of judging the diameter of the swab, with and without the cotton, is by comparing it with the openings in sound scale.

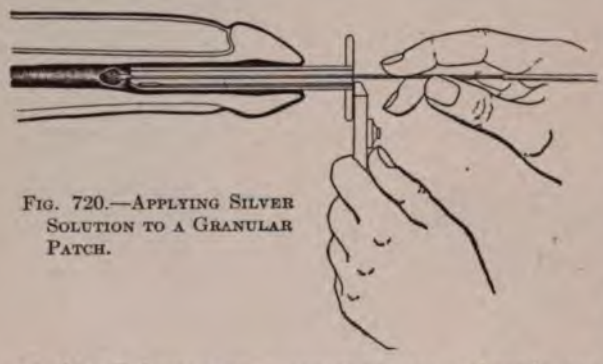


Fig. 720.—Applying Silver Solution to a Granular Patch.

Papillomatous growths are destroyed by electrolysis or galvanic cautery, or else snared off. I must say that I have never cared to use galvanic cautery through a urethroscope, nor have I been successful in snaring them, usually removing them in small bits. Electrolysis causes them to shrink up and is a good method to employ. Polyps are removed by a snare.

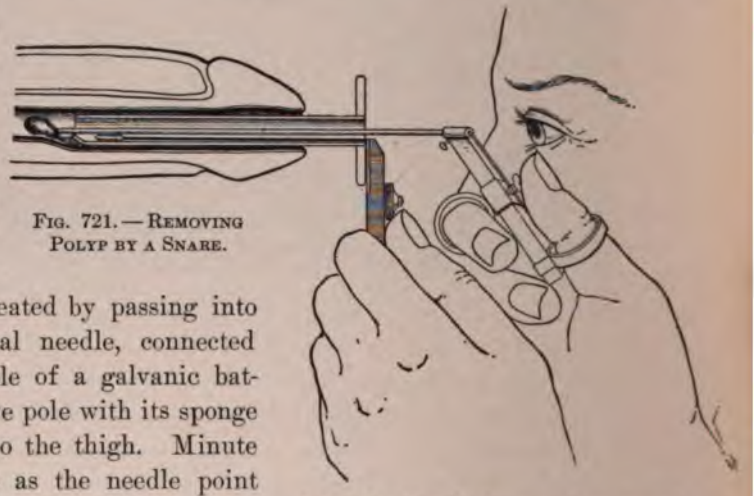


Fig. 721.—Removing Polyp by a Snare.

Urethral glands or follicles that are dilated and chronically inflamed are treated by passing into them a fine electrical needle, connected with the negative pole of a galvanic battery, while the positive pole with its sponge electrode is applied to the thigh. Minute white bubbles escape as the needle point destroys the gland with its microörganisms. An adhesive inflammation results and obliterates them. The current should be three to five milliampères and the duration of the electrolytic action not over a minute. Kollmann has devised a little knife that can be passed through a urethroscope into the follicle by means of which it can be split open, and he also has a minute curette for scraping it, as well as a delicate

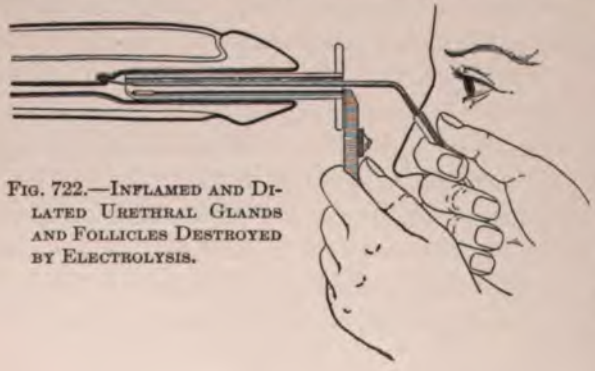


Fig. 722.—Inflamed and Dilated Urethral Glands and Follicles Destroyed by Electrolysis.

needle with which he washes the gland with a two-per-cent solution of silver nitrate by means of a small syringe. (See Urethroscopic Instruments, page 191, Vol. I).

Chronic areas of inflammation, soft and hard infiltrates, granular patches, erosions and ulcers, are usually cured by dilatations with sounds or dilators every other day, followed by irrigations of silver-nitrate solutions and accompanied by astringent injections at home. It is only the obstinate cases that require treatment through the urethroscope.

Various remedies have been advocated to be used through the endoscope. Lydston, of Chicago, uses:

| | | | |
|---|---|---|---|
| ℞ Iodoform | | ʒij | 7.76 |
| Tinct. benzoin comp. | | | |
| Balsam Peru | āā | ℥j | 30. |

M. S.: Apply through urethroscope.

| | | | |
|---|---|---|---|
| ℞ Iodin | | grs. x | .66 |
| Potass. iodidi | | ʒj | 3.88 |
| Eucalyptol | | ʒj | 3.88 |
| Glycer. tannin | | ʒij | 7.76 |
| Acid. carbol. | | grs. x | .66 |
| Boro-glycerid. | q.s. ad | ℥j | 30. |

M. S.: Apply through urethroscope on swab.

(4) **Radical Treatment.**—The radical treatment of chronic urethritis consists in operating on any condition that is a causative factor in the continuation of the chronic discharge. In the case of urethral calculi, they should be removed. In the case of a narrow meatus, or a urethral stricture that does not yield to dilatation, the narrowing should be cut (urethrotomy). Sometimes a gleet or even a fairly acute urethral discharge will continue for months or years in cases in which a stricture is present and urethral dilatations and irrigations have no effect upon it; but the discharge stops quickly after a urethrotomy. I was at first afraid to perform urethrotomy in cases of stricture of a moderate size when an acute discharge was present that had lasted for months, and I considered it uncalled for treatment. Further experience has convinced me that such a condition at times requires a urethrotomy, if we wish to cure the patient, although the danger of a complication is much to be feared. The strictures in these cases are in the anterior urethra.

**Treatment of Chronic Posterior Urethritis.**—Chronic posterior urethritis is usually associated with an anterior urethritis, a prostatitis, or both. In case it is associated with other affections of the genito-urinary tract, they should be treated as well. The fact that the posterior urethra is a continuation of the anterior and is surrounded by the prostate gland makes it evident how

closely associated these parts of the genito-urinary tract are in all inflammatory conditions.

The *radical treatment* of chronic posterior urethritis is frequently similar to that of a chronic anterior inflammation when it depends on an obstruction along the anterior part of the canal. It consists in the removal of the cause either by dilatation or operation, after which the inflammation often subsides gradually without further treatment.

When it is associated with chronic prostatitis, the treatment depends on whether the prostatitis is hyperesthetic or atonic. (See chapter on Prostatitis.)

The symptomatic treatment of chronic urethritis calls for the alleviation of pain, tenesmus, frequency of urination on one side and sexual debility on the other. In the first instance, hot sitz baths, palliatives and antispasmodics are given. In the second instance, stimulants are indicated for the atonic impotence often present.

Pain, tenesmus and frequency of urination occurring together indicate an acute exacerbation, and hot sitz baths are recommended. A mixture containing tincture of belladonna and benzoate of soda, or one of hyoscyamus and acetate of potash, is also beneficial. The prescriptions for these remedies are written as follows:

| | | | |
|---|---|---|---|
| ℞ | Tr. belladonnæ | ♏ vijss | 0.5 |
| | Sodii benzoat | grs. xv | 1.0 |
| | Aq. gaultheriæ | q.s. ad ℥j | 4.0 |

M. Sig.: One such dose t.i.d. in a glass of water between meals.

Or,

| | | | |
|---|---|---|---|
| ℞ | Tr. hyoscyami | ♏ xv | 1. |
| | Potass. acetat. | grs. xv | 1. |
| | Aq. menth. pip. | q.s. ad ℥j | 4. |

M. Sig.: One such dose t.i.d. between meals in a glass of water.

Pain occurring in chronic inflammation of the posterior urethra alone is very rare and it generally accompanies an associated prostatitis. For the feeling of irritability and discomfort in the perineum and slight frequency of urination, such as often occur in chronic posterior urethritis, the belladonna and benzoate of soda mixture is also excellent.

The treatment of the discharge, however, is what claims our special attention. This usually does not show itself at the meatus, except in the morning when the patient has had erections during the night. The shreds passed out in the first urine, after the anterior urethra has been washed out, together with the subjective symptoms already mentioned, point to its existence.

The preferred treatment is by instillations of nitrate-of-silver solution by means of an Ultzmann syringe, beginning with one grain to the ounce, and in-

creasing with subsequent treatments to five, ten and fifteen grains. These may be given every other day or twice a week. In case the patient has associated chronic prostatitis of a hyperesthetic type, hot rectal douches of salt solution given by the recto-genital tube do much to improve the condition. Massage of the prostate also reduces the chronic inflammation of the gland and indirectly benefits the canal itself.

In cases in which follicular abscesses of the prostate have broken into the urethra, the stretching of the posterior portion of the canal by the Kollmann dilator, followed by irrigations of nitrate-of-silver solution, is indicated. The stretching of the posterior urethra and massage help to cause absorption of exudates in the prostate, to free certain ducts that have been pressed upon by exudates or scar tissue and to restore the prostate as nearly as possible to its normal condition. This also benefits the posterior urethra that passes through it.

In the treatment of exacerbations in chronic posterior urethritis, instillations are recommended of one fifth to two per cent of silver solution; of one to five per cent of copper-sulphate solution; of three to twelve per cent of thallin sulphate solution. Solutions of protargol one half to five per cent, argyrol five to thirty per cent, ichthyol two to ten per cent, are also employed. Glycerate of tannic acid diluted with water is another excellent astringent instillation.

## GONORRHEAL URETHRITIS AND MARRIAGE

Under this heading, we must consider the transmission of infection from the husband to the wife, and *vice versa;* for, while the first occurs much more frequently, I am inclined to believe from a large practice among both sexes that infection of the husband by the wife often occurs.

The transmission of gonorrheal infection in marriage to innocent women and children is of such frequent occurrence that the question as to the time when a man infected by the gonococcus may marry ranks among the most important of the social problems that we have to judge of. The question is, when does gonococcal urethritis cease to be infectious and when can the surgeon safely give his sanction to the marriage of a patient who has been infected with this disease?

Probably the researches of Noeggerath gave the greatest impetus to the study of this question, as it was he who first called the attention of the profession to the ravages of gonorrhea in women; to the frequency of sterility as a result of gonococcal infection of the uterus and tubes, and to the astonishing tendency of the gonorrheal process in women to remain latent for months and years and break out unexpectedly in a dangerous form.

Gonococcal infection of the infant during the process of birth is now, happily, less frequent, since the introduction of the prophylactic instillations of

silver nitrate into the eyes of the newborn, according to Credé's method. But the ocurrence of gonorrheal ophthalmia in newborn children, with consequent blindness for life, is still an occurrence sufficiently frequent to be a contributing factor, showing the necessity of postponing marriage until the gonococcal process in the male urethra, prostate and vesicles has been cured or rendered innocuous.

The following statistics taken from the report of the Committee on Prophylaxis of Venereal Diseases, Washington State Medical Association, are of interest:

Eighty per cent of all men in large cities have gonorrhea once or several times; forty-five per cent infect their wives.

Eighty per cent of all operations upon women for diseases of womb and adnexa are caused by gonorrhea.

Twenty per cent of all blindness is due to germs of gonorrhea entering the eyes of children at birth.

It goes without saying that, when a patient has a persistent discharge, shreds in the urine and a tendency to relapses, marriage should be absolutely out of the question; and yet, in a number of cases, patients of mine, with both acute and chronic urethritis, have married contrary to my advice, and have not infected their wives locally and have had healthy children with normal eyes. In fact, I can recall but one case, as I look back, where a private patient has inoculated his wife—at least to my knowledge. I can recall, however, some very narrow escapes. On one occasion a man, on the night of his bachelor dinner, was exposed and three days before his wedding developed an acute urethritis. He was put on treatment, insisted upon being married at the appointed time, but abstained from intercourse for over three months, at which time there was no evidence of the disease present, and even then for a long time he indulged in coitus only with condoms.

As long as there is the slightest discharge, or there are the minutest shreds in the urine, especially if these contain pus cells, or there are gonococci or pus in the massaged products from the prostate or vesicles, or as long as there are lesions demonstrable by the urethroscope in an unhealed state, the practitioner should refuse his sanction to marriage.

In such cases, a systematic course of treatment, prolonged if necessary for months, should be pursued, including the treatment of the urethra, of the prostate and of the seminal vesicles, until a cure has been obtained.

When no gonococci or pus can be found upon repeated examination, the patient can be allowed to marry and we can feel that, although he may infect his wife, that it is extremely improbable and that as far as we are concerned, we have taken the necessary precautions. I may add that I have prepared many men for marriage and that I have never known an instance in which one of them has infected his wife after having passed the above examination.

Even then, the patient should be examined from time to time and his urine inspected for a number of weeks before he actually is given permission to marry. Patients who are not willing to undergo the treatment, or to wait the prescribed time, must simply be told by the physician that he cannot assume any responsibility whatever for the consequences of the marriage.

When the process has not been completely eradicated so far as discoverable lesions are concerned, an exacerbation frequently occurs under the influence of the sexual excitement incident to the first weeks of married life.

Let us now take up the other side of the question, the man who has married and has been infected by his bride. The blow here is scarcely less crushing; it may be even more so. Such an event usually takes place in marrying widows, divorcées or women who have had affairs with other men. In such a case the woman may not be aware of her infection at the time of her marriage, as she may have had her symptoms some time before and been told that she has taken cold in her bladder to account for the frequency of urination, that she has an inflammation of the womb to account for her discharge, that she has peritonitis to account for her salpingitis and finally that she has leucorrhea to account for the chronic uterine discharge that resulted. All these infections have without doubt been the result of previous relations and these women innocently marry, not knowing that they have had an infectious disease and can infect their husbands, and neither do the newly acquired husbands suspect them. In the case, however, of a man who marries a prostitute, and such marriages are frequent, he notices in many cases that he has been subjected to infection.

Such women rarely come to us before marriage, but when they do, we must treat them on the lines of chronic urethritis, Bartholinitis, endometritis and salpingitis, until those conditions are cured, before permitting them to marry. A woman of questionable character sometimes marries when she knows that she has the disease. On one occasion, a woman called during my morning office hours, saying that she had a discharge and was somewhat worried, as she was going to be married soon. Further questioning elicited the information that she was going to be married that afternoon. On examination I forbade the marriage and told her what the consequences would be. She paid no attention, however, to my warnings, and the marriage was consummated.

## NONSPECIFIC URETHRITIS

The bacteriological studies of urethral discharge since the discovery of the gonococcus have shown that a urethritis may develop without its presence and consequently the name of nonspecific urethritis has been given such a condition.

**Etiology.**—It has been shown that the predisposing cause of this variety is some irritation of the urethral canal giving rise to congestion. Such an irritation may be brought on by the rough passage of instruments, by excessive indulgence in alcoholics or coitus, or by throwing off in the urine large quantities of microbes or toxins in cases of rheumatism, typhoid fever, influenza or other infectious diseases. The germs that give rise to a nongonococcal urethritis are the streptococcus, the Staphylococcus aureus, Bacterium coli, the Micrococcus cereus albus, the Micrococcus subflavius, the Micrococcus of Lustgarten and Mannaberg and other cocci and diplococci.

Whenever these bacteria are found in the urethral flora, it is probable that they may under certain conditions be made sufficiently active to produce an inflammation when some irritation of the urethral canal is present. It has been shown by inoculation of the urethra with both streptococcus and staphylococcus that a urethritis may be brought on.

**Clinical Features.**—Clinically, it is almost impossible to differentiate cases of nongonococcal urethritis from those caused by the gonococcus. The acute symptoms are very rarely as intense in the nongonococcal type as in the gonococcal. But this does not aid us, as mild cases of gonococcal infection occur frequently enough. When the discharge is abundant there is not as much congestion of the meatus and the end of the glans as is usually seen in a gonococcal case with the same amount of discharge. The absence of gonococci upon repeated examination confirmed by Gram's stain should certainly be given weight in favor of a nongonococcal process. Yet it must not be forgotten that acute exacerbations of a gonococcal urethritis may occur with scarcely any gonococci in the urethral discharge. When the discharge is scanty, the cases become still more puzzling and it is then difficult to distinguish them from chronic gonorrheal cases.

The possibility that the gonococcus may be absent from the discharge of a true gonococcal urethritis, especially in the chronic stage, is what makes the diagnosis of nongonococcal urethritis so uncertain and difficult of differentiation. It is quite safe, however, to consider that the case is not specific when it lasts only a few days during which no gonococci have been found in the discharge, or when, after a daily examination for a week, no gonococci have been found and the discharge has been decreasing rapidly under conservative treatment.

**Treatment.**—The treatment of nongonococcal urethritis consists in giving the patient the diet outlined under the treatment of blennorrhagia: Sandalwood-oil emulsion three times a day, and hot sitz baths before retiring. At the end of three days, if the discharge is still present, an astringent injection is given, preferably the one containing carbolic acid, alum and zinc sulphate mentioned under Acute Urethritis. A feature to be noted in connection with nongonococcal cases is that they are sometimes far less amenable to treatment than specific urethritis. Generally, however, the attacks are mild and last but

from three to five days. In the majority of cases, the discharge would probably disappear without treatment.

The stools are kept soft with saline laxatives and plenty of water should be drunk.

## TUBERCULOSIS OF THE URETHRA

Tuberculosis of the urethra is generally associated with prostatic tuberculosis.

**Etiology.**—Urethral tuberculosis is never primary, but secondary to a genito-urinary tuberculosis elsewhere, the infection usually taking place through the urine containing tubercle bacilli. The predisposing factors are congestion from traumatism and other causes.

**Pathological Anatomy.**—Lesions are noted in the urethral mucosa, as well as in the periurethral tissues and in the prostate gland. The lesions of the mucosa especially involve the deep or bulbous portion of the anterior urethra (Fig. 723) and the prostatic part of the canal. The tubercular granulations are rarely noticed, at the beginning of the trouble, but usually ulcerations similar to those of the other mucous membranes and cavities. Caseous infiltrations are occasionally seen, especially in the prostatic portion, covering the urethra with a yellow cheesy layer.

Fig. 723.—Tuberculosis of Urethra. (After Desnos.)

Fig. 724.—Martin Ware's Case of Tuberculous Urethra.

The periurethral lesions are sometimes found in the corpora cavernosa, connected with ulcerations or cheesy infiltration of the urethral mucous membrane, or independent of them. Extensive cavities may also be present opening into

the urethra, especially from the prostate gland, forming large sinuses; at times the prostatic urethra is practically destroyed (Fig. 598). Tuberculosis of Cowper's glands is frequently spoken of, but practically no cases of this are on record. Dr. Hatch, one of my clinical assistants, was detailed to the study of Cowper's glands, and after a year's investigation with clinical and autopsy material he failed to find a single case. Tuberculosis of the meatus has occurred (Fig. 724).

In tuberculosis of the urethra in which a destructive process has taken place, a strictured condition remains which is especially noted in the prostatic urethra. Dense fibrous exudates may also take place in the penile portion.

**Symptoms.**—The subjective symptoms of tuberculous urethritis are usually masked by those of cystitis or prostatitis, to which it is secondary. They are frequent and painful urination with tenesmus when the trouble is situated in the posterior urethra, although the tuberculous urethritis causes painful urination independently of an existing trouble in the bladder or prostate. The discharge resembles that of a chronic blennorrhagia, that is, slight and not constant. It is sometimes of a slightly pink tint. Exploration of the urethra with bougies à boule or sounds shows great tenderness of the part of the canal in which the lesions are situated, together with a tendency to a spasmodic contraction of the cut-off muscle. By palpation of the canal, painful and indurated areas are sometimes felt. Urethroscopy may show areas of pale mucosa, in which small ulcers are scattered with irregular and red margins. Indolent ulcers of larger size are sometimes seen.

**Treatment.**—The treatment of tuberculosis of the urethra consists of general and local measures. The general are supportive and palliative. Among the supportive are creosote carbonate, three grains three times a day in capsules after meals, and sirup or the iodid of iron ʒss three times a day between meals. The diet is simple and nourishing. Pain and frequency of urination are treated with palliative remedies, such as morphin, codein, belladonna, hyoscyamus, chloral and the bromids, the same as in acute posterior urethritis and of tuberculous cystitis. (See Tuberculous Cystitis.) A rubber urinal is worn by day if the frequency is very great and a duct is kept in the bed by the side of the patient at night. Hot sitz baths relieve the symptoms in some patients and aggravate them in others. Local treatment consists in injecting into the part of the urethra involved, through a soft-rubber catheter by means of a urethral syringe, from two to four drachms of ten-per-cent argyrol, twenty-per-cent gomenol, or five-per-cent iodoform emulsion. Argyrol is a most potent remedy when used just after washing the part with a 1 : 4,000 to 1 : 2,000, or even a stronger solution of nitrate of silver. (Desnos reports good results from instillations of picric acid and also pyrogallic acid.)

One of the most important points to remember is to examine the urethra carefully for stricture. If a congenital stricture of the meatus or of the fossa

navicularis is present, it should be cut to 32 French. When abscesses form in the perineum, they should be opened and drained. Fistulas should not be operated until the patient's general condition has improved, as all operations requiring rest in bed afterwards tend to undermine the patient's condition and it is better for him to go about and have the fresh air and moderate exercise.

Cystotomy for drainage is recommended to relieve the urethra, but I do not recommend it, as it makes the patient very uncomfortable, besides predisposing to tuberculous development in the bladder.

## SYPHILITIC URETHRITIS

It is said that a syphilitic urethritis may occur during the secondary stage of the disease. This may be so, but in treating several thousand cases of syphilis I have never seen a urethritis that I thought was due to secondary syphilis. I have, however, seen many cases of initial lesion of the urethra—chancre. This may be seen either in the form of an ulceration, an erosion or an infiltration. In the case of an ulcerating chancre, which is very rare, the sore resembles a chancroid, except that it is harder, but not so acute, and the discharge is less abundant and bloody.

An erosion or an infiltration shows itself as nothing unusual, but, on close examination, the meatus seems smaller than usual and not so pliable. On opening the meatus, the walls look pink or reddened as if the epithelia had been scraped away. On palpating the end of the glans, the meatus is noticed to be thickened and indurated. The discharge is not so abundant. On examining a specimen microscopically, it will be found to contain no gonococci, but the spirochetæ of syphilis.

An infiltration of the meatus is similar to an erosion, except that it lacks the raw appearance.

I have had many cases of chancre of the meatus brought to me in consultation as cases of gonorrhea or nonspecific urethritis. All of them were treated with lotio nigra locally and tannate of mercury internally, and they were cured with no other deformity of the end of the canal than a stricture.

I have treated several thousand cases of gonococcal urethritis and syphilis and yet on one occasion I treated a case of urethritis due to a nonulcerating initial lesion of the canal thinking that it was a nonspecific urethritis, until the secondaries appeared. In this particular case there was quite an abundant discharge. It was a great lesson to me in diagnosis, as I had seen a number of cases before this occasion and had recognized them immediately.

**Treatment.**—The ulcerating chancre should be treated the same as a chancroid. In case it is an erosion or an infiltration, it is not necessary to cauterize the lesion but only to treat it by plugs of cotton saturated with lotio nigra. These plugs are made by wrapping a piece of absorbent cotton about

the end of a toothpick or broom straw until it assumes a conical shape. (See page 434). This is inserted into the urethra following each act of micturition, in the same manner as following meatotomy, after soaking it with lotio nigra. Both chancre and chancroid of the meatus result in the formation of fibrous scars and strictures.

## CHANCROIDAL URETHRITIS

Chancroid of the urethra is comparatively rare and we have had but few cases in the hospital and clinics during the last twenty years. In these cases, there is quite an abundant discharge of pus mixed with blood, and pain and burning on micturition.

**Diagnosis.**—Examination shows the ulceration at or just within the meatus. The pus does not show gonococci on microscopical examination unless a gonococcal urethritis complicates the disease. Spirochætæ are not present, but the Bacillus of Ducré may be found.

**Prognosis.**—The lesion usually lasts for three or four weeks and leaves some contraction after healing.

**Treatment.**—The lesion is cauterized with a strong silver solution—twenty-five per cent or more—or by the silver stick, and a plug of absorbent cotton soaked with lotio nigra is kept in the end of the urethra as a wet dressing in a similar manner to that described under luetic (syphilitic) Urethritis and Meatotomy.

## TRAUMATIC URETHRITIS

Traumatic urethritis is usually due either to rough manipulation of the canal with instruments, or to the presence of calculi in the canal. In the former case the congestion caused by the traumatism is the predisposing cause, whereas the infection may be due to pus-producing organisms on the instrument itself, if dirty, or else to irritation and congestion rendering active germs already present in the canal.

In the case of urethral calculi, the congestion follows the traumatism occasioned by the stones themselves plus infection by the microbes inhabiting the urethra, or the introduction of germs from some other source. The removal of the calculi will in itself produce a cure.

# CHAPTER LVIII

## STRICTURES OF THE URETHRA

STRICTURE of the urethra is an abnormal, localized narrowing of the urethral canal at some part of its course.

**Causes.**—The narrowing may either be congenital, acquired or traumatic.

A *congenital* narrowing is one that has existed since birth.

An *acquired* stricture is one that is due to disease, usually venereal. This has given rise to some lesion along the canal which has resulted in a thickening and contraction. The most frequent variety are strictures due to a gonococcal urethritis which has become chronic at some point and given rise to an infiltration or thickening which has resulted in fibrous tissue. They may develop in a few months during an attack of urethritis, although from one to two years are usually required for their formation. If they do not develop within the first ten years following an attack, the probabilities are that they will not, as the percentage after this period is almost nil.

A chancre or chancroid of the canal, which sometimes occurs at the meatus, may also give rise to stricture. All these lesions are the result of venereal disease. Strictures may also result from the contraction following abscesses of the urethral glands, periurethral abscesses or slow urinary leakage.

A *traumatic* stricture is the result of an injury, usually a blow or a fall. In the case of a fall, the patient usually strikes on his perineum and presses the urethra between the impinging body and the pubes or the subpubic ligament in such a way as to give rise to injury or rupture of the canal. A bullet wound may also cause such a stricture, as may a cut from any sharp weapon. A surgical instrument inserted into the urethra with too much force for the purpose of catheterization or dilating strictures may also give rise to an injury or rupture and cause a traumatic stricture. Injury of the canal by urethral calculi is another cause. Strictures may also be due to traumatism of the urethra together with the corpus spongiosum when a patient endeavors to straighten out a chordee by shutting a window upon the organ or pressing, or by striking it with books or other objects; also when some accident occurs during coitus. Strong injections in the abortive treatment of urethritis have also been known to produce such results.

**Varieties.**—Strictures are variously described according to their position, consistence, form and size.

The POSITIONS spoken of are anterior and posterior. It is said by many that the *posterior* strictures never occur; that the posterior urethra is the largest portion of the canal and cannot be narrowed sufficiently to be spoken of as a stricture. This is not the case, however, and I have at times, after performing a perineal section, found organic strictures of the posterior urethra, that I have had to dilate forcibly with my finger. Such conditions are very rare and I have never seen a case in which the narrowing was very pronounced. They are due to tuberculous or gonococcal inflammation with destructive changes and scar tissue formation resulting in contraction of that part of the urethra. *Anterior* strictures may occur in the pendulous, scrotal or perineal portions of the urethra. When they occur behind the scrotum in the perineal portion, they are spoken of as deep. Strictures are most common from one to two inches from the meatus, at the peno-scrotal junction, and about one inch in front of the bulb. The gravity of a stricture is in direct proportion to its proximity to the bladder.

The CONSISTENCE of strictures varies from a thickening of the mucous membrane with a connective-tissue proliferation occurring in its depths to the formation of a dense mass of cicatricial tissue occupying the submucosa and extending into the meshes of the corpus spongiosum. Certain narrowings of the canal are sometimes spoken of as hard and soft infiltrates. Soft infiltrates are the thickenings of chronic inflammation along the canal, whereas hard infiltrates are thickenings in which fibrous changes have already taken place, and are strictures proper. Soft strictures yield easily to dilatation. Hard strictures are dense and unyielding in a varying degree. A resilient stricture is another variety which can be stretched but which rapidly returns to its original condition.

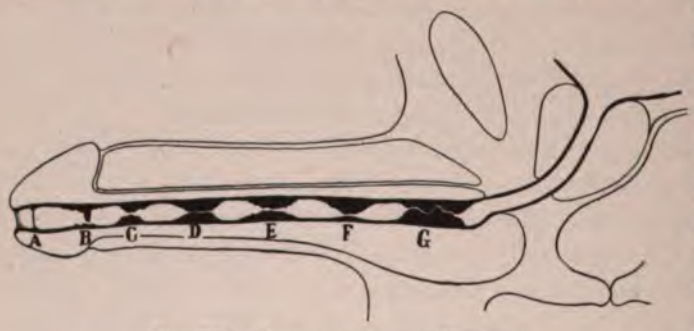



FIG. 725.—STRICTURES OF THE URETHRA.

*A*, linear.
*B*, valvular.
*C*, annular.
*D*, long, thick and regular.
*E*, long, thick and irregular.
*F*, stricture thick above and thin below.
*G*, tortuous stricture.

Strictures also vary in FORM (Fig. 725).

A *linear* stricture is one which resembles a line drawn around the canal as if a piece of very thin cartilage, or, more properly speaking, unyielding fibrous tissue, extended around it at a certain point. Congenital strictures are usually of this variety and are generally situated in front or behind the fossa

navicularis, at the meatus, or, rarely, in some other portion of the pendulous part of the urethra.

*Annular* strictures resemble the linear variety, except that they are wider and may not be hard, although their consistence is usually quite resistant. They are more like a ring about the canal.

*Irregular* strictures are composed of thickened masses in certain places along the urethra, which may not entirely surround it. They may be of any consistence.

A tortuous stricture is one which extends for some distance, that may or may not completely surround the urethra, but which renders the urethral canal irregular or winding. Tortuous strictures are usually quite dense and the portion of the canal through them is generally of small caliber.

In SIZE, strictures are spoken of as of large caliber, small caliber, filiform or impassable. A stricture of large caliber is one which admits a No. 15 French sound and of small caliber when it does not. A filiform stricture is one that no instrument except a filiform bougie can pass. An impassable stricture is one that neither a filiform nor any other instrument can pass through.

There are also two other varieties spoken of, viz.: The inflammatory and the irritable. The INFLAMMATORY consists of an inflammation about an already existing stricture, such as occurs in an attack of urethritis in an individual who already has strictures. An IRRITABLE stricture is one that bleeds easily, has probably an infiltration or granulations beside the stricture.

Certain strictures are MOVABLE in that they can be pushed upward or downward, as they seem not to have as firm a base as common. They are generally old strictures that have been forcibly dilated with sounds. In performing perineal operations, I have at times passed my finger from the perineal opening into the part of the canal anterior to my incision and introduced it into a stricture that I could move backward and forward.

The varieties of strictures that I have just mentioned are all pathological. There is another variety, however, which is functional.

SPASMODIC STRICTURE.—This is of a functional type, in that the stricture itself is not due to a pathological condition *per se,* but is merely a temporary contraction of a muscle, spasm at a certain point of the canal. The muscle is either the compressor urethræ (cut-off muscle) or the sphincter muscle of the bladder. In the first instance, the spasm of the cut-off muscle is due to a congestion or inflammation of the posterior urethra. In the second place, the spasm of the vesical sphincter is due to a similar condition of the neck of the bladder. It will thus be seen that a spasmodic stricture is a reflex contraction on the part of Nature to protect the tender area to which it forms a gateway or guard.

**Pathology.**—The pathological process of stricture may be said to be the formation of fibrous tissue at a certain point in the canal. In the congenital

stricture, it is the result of malformation in a slight degree. In the traumatic stricture, it is the result of a direct injury, a laceration which results in the formation of scar tissue which is dense and fibrous. In acquired stricture, it is the result of an inflammation which is followed by induration and contraction and scar tissue. An acquired stricture is usually due to gonorrhea. The gonorrheal process becomes located in some area along the canal, resulting in an infiltration. This infiltration is generally about a urethral gland or at some point where the urethral membrane has lost its epithelium. The urine could then soak into this denuded area, but an inflammatory exudate and protective barrier of lymph are thrown out to protect the point of possible leakage. This plastic exudate becomes organized tissue. It grows dense, forming fibrous tissue, and contracts into a stricture.

Granular patches, erosions or ulcerations have an infiltration of round cells about their bases in the submucous connective tissue which becomes fibrous tissue and contracts, thus narrowing the canal.

**Symptoms.**—A stricture of any size acts more or less as a dam to the outflow of urine. At the point where the stream impinges against the obstruction, the frequent repetition of micturition causes this area to be the seat of congestion and inflammation, which not only may increase and form granulations and erosions, but may simultaneously increase the deeper inflammation of the submucous tissues, and consequently the size of the stricture. Thus is established a vicious circle, and in this we see the reason for its constantly growing worse, and its unfavorable tendency to form other and larger obstructions.

The symptoms depend on whether the stricture is congenital, traumatic or acquired, and also on whether or not infection is present. The principal symptoms of stricture in the case of a patient who has had no inflammation of the canal are some disturbances of urination, whereas, if there has been an infection and inflammation, a chronic discharge or turbid urine is present.

The disturbances of urination vary according to the variety of the stricture. If it is a congenital narrowing, the stream is simply finer than usual.

Traumatic Stricture.—In traumatic stricture, the stream is also narrower, generally lacks force and is frequently accompanied by some difficulty in voiding. As the result of the dilatation behind the stricture, there may be dribbling of urine, besides which the congestion of the posterior urethra or bladder behind a traumatic narrowing may cause frequency of urination. If the obstruction is marked, there may be retention of urine, or incontinence due to an overflow retention (Fig. 726). There may also be pain in the perineum or suprapubic region. A cystitis is liable to develop if the canal is much interfered with, as the result of the back pressure, producing vesical congestion and predisposing to infection.

Acquired Stricture.—In an acquired stricture, following chancre or chancroid, cicatricial tissue remains after the lesion has healed, generally not accompanied by inflammation or discharge.

In a stricture of gonorrheal origin, however, the story is a different one. There has been a chronic urethritis, localized somewhere along the canal. When the stricture is forming, the inflammation still exists over the stricture during its formation and behind it after it has formed. The stricture itself then forms an important factor in the continuance of the inflammation and the consequent discharge, and influences its chronicity on account of the back pressure which is brought to bear on the urethra behind the strictured portion of the canal in each act of urination, as it suddenly dilates that part of the urethra and keeps up the irritation.

The discharge in chronic urethritis complicated by stricture is usually slight and muco-purulent; sometimes it is a simple moisture at the meatus, while at other times there is a tendency for the sides of the meatus to stick together. In many cases there is no discharge during the day, but a slight drop may be present in the morning. This chronic type of urethritis is called "gleet."

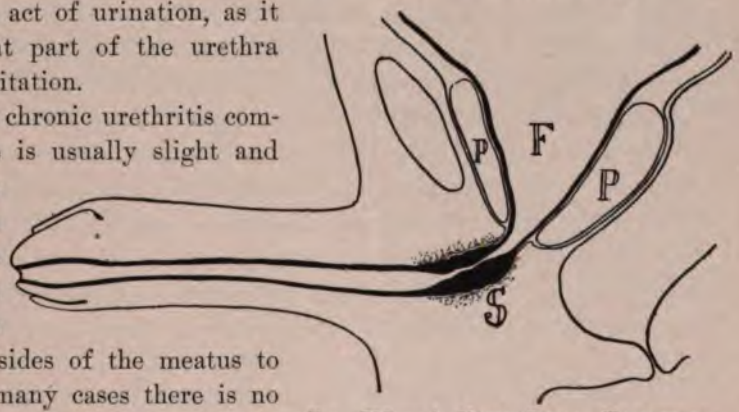



Fig. 726.—A Very Small Traumatic Stricture of the Urethra with a Dilation behind It.

*S*, stricture. *F*, funnel-shaped dilatation of urethra behind stricture. *P*, prostate.

Gleet is the principal early symptom of stricture and should always lead to an examination of the canal. Sometimes a moderately acute inflammation is associated with stricture and I have seen cases with a constant discharge, resembling an acute urethritis, continue for months, which no local treatment other than an operation could cure. Such cases, however, are very rare.

Pain is another symptom of stricture. It is situated in the perineum and most frequently accompanies deep strictures, that is, those in the perineal portion of the canal. The smaller and deeper the stricture the more marked the pain. This is not, however, acute, but of a dull character.

Disturbance of the urinary stream is a symptom to which the patient usually attaches much importance. A *small* stream is significant of the narrowing of the canal. A *twisted* stream is a symptom of irregular or tortuous stricture. It does not necessarily mean that the patient has bad strictures, but that there is an unevenness of the canal which tends to give it the rifle-bore effect. The patient is usually very much worried over this irregularity of the stream and attaches much importance to it.

Disturbances of urination are much more important than disturbance of the stream. There may be undue frequency, difficulty, dribbling, retention, incontinence, or retention and incontinence combined.

*Frequency of urination* is a most important symptom of stricture. It may be termed the flag of danger, or the first danger signal in the group of symptoms associated with stricture. It shows that the bladder has begun to feel the strain of forcing urine through a narrowed passage and that there is some congestion of this organ giving rise to irritability and frequency. It is also a danger signal pointing to future complications, as it means a probable impending infection of the bladder, the middle portion of the urinary tract and frequently, if the stricture is not attended to, an infection of the kidney at a still later date. Frequency of urination in stricture is relatively more marked during the day when the patient is up and about and the urine comes in contact with the vesical neck, the most congested part of the bladder, than at night when the patient is lying down and the pressure of the urine is taken away from the urinary orifice. Frequency of urination in stricture cases is sometimes quite marked. In other words, there are exacerbations. These are caused by excess of alcoholic drinks and by exposure of the lower extremities to wet and cold. A person with stricture generally experiences frequency of urination more during the fall of the year when cold weather is coming on, than at any other time.

*Dribbling of urine* occurs to a slight degree in cases in which there is a dilatation behind the stricture and a few drops of urine accumulate there which afterwards leak out when the patient makes some sudden movement of the body, as in walking or running.

Complications.—Under this heading may be considered the late symptoms and the sequelæ of stricture such as retention of urine, incontinence, cystitis and the sequelæ that often appear in neglected cases, pyelitis, pyonephrosis and pyelo-nephritis.

*Retention of urine,* a sudden inability to urinate, usually spoken of as an acute retention, is a later symptom of stricture. It is the second danger signal, as it points to an emergency condition and marks a crisis in the history of the disease. The patient must then look out for himself or his life will be shortened. Retention of urine occurs more frequently with deep strictures, situated just in front of the bulb. In other words, the nearer the bladder the stricture is, the greater the danger of retention. A stricture of a certain size causes retention when situated in the deep urethra, that would not give rise to it if it were in the anterior portion of the canal. An 18 French stricture in the perineum has, in a number of my cases, given rise to retention, whereas the same size in the anterior urethra has never caused it. Some patients have had a number of attacks of retention and still continue without treatment, using some means of overcoming the condition, or else relieving it by catheterization. At-

tacks of retention in patients with strictures of small size are due to congestion about these narrowings, following exposure or excesses, that otherwise would not have taken place. In other words, a patient with a stricture of, say, 18 French in the deep urethra, might have an attack of retention after a day or two of indulgence in alcoholics and coitus, which, after its relief, would not occur again until he has indulged in another similar debauch. The majority of patients suffering from attacks of retention have strictures smaller than 18 French, and No. 18 should be considered as rather the maximum size giving rise to retention. Incomplete, partial or chronic retention occurs in patients suffering from stricture who persist in ignoring systematic treatment. By this I mean residual urine, in that they are not able to empty their bladders fully, and a retained residuum always remains after each act of micturition, varying from one ounce to one pint according to the size and duration of the obstruction. If the condition is allowed to go on untreated, the stricture continues to narrow and the amount of residual urine to increase in quantity until the urethra and bladder dilate in the form of a funnel behind the stricture (Fig. 726).

*Overflow retention or incontinence* is a later stage of such a condition. The retention becomes more complete, the passage of urine is frequent and in small squirts and there is frequent or constant dribbling. This is known as overflow incontinence and the dribbling is much more marked than the few drops that leak out from small dilatations behind strictures. Such a condition is a serious one and, if allowed to go on, the obstruction will result later in dilatation of the ureters, the pelvis of the kidneys, pyelitis, pyelo-nephritis, or pyonephrosis and death.

*Inflammation of the bladder,* cystitis, may occur at any time when a stricture is present. The congestion of the bladder that we have already spoken of is the predisposing cause of cystitis. It only remains to have the pathogenic germs carried in on unclean instruments; or pushed in from an infected urethra during instrumentation for the purpose of examination or treatment to relieve an attack of retention of urine. The infection may also enter the bladder by an extension of the inflammation back from the stricture along the urethra, or through the bladder wall by the blood current, or through the bladder wall from the rectum. The symptoms of cystitis are the same as those of congestion which we have already considered, plus the presence of pus in the bladder. A cystitis in this case is chronic and is liable to acute exacerbations.

*Frequency of Urination.*—The sense of burning and tenesmus that accompany a congestion of the bladder are also present, but usually more marked, especially when acute exacerbations of the cystitis are present. The dull *pain* in the perineum, accompanying stricture, may also occur in these late cases of strictures accompanied by cystitis, as well as pain in the suprapubic region where it is also dull, with a sense of fullness. During an acute attack of retention, however, the suprapubic pain may be intense.

*The urine in stricture* varies according to the stage of the disease and its complications. In urethral stricture, accompanied only by a chronic urethritis, the first urine, which contains the urethral washings, is usually clear with a few shreds, or, if there is much discharge, it may be turbid with shreds. The second urine passed, after the urethra has been washed out by the first specimen, is clear. This is also the case when there is a congestion of the bladder. When cystitis has developed, however, the first and second urines are both turbid, though there are more shreds in the first urine which contains the urethral washings.

There are other complications of stricture, which are treated more fully elsewhere, that we may consider briefly in this chapter, such as periurethral abscess, extravasation of urine, urinary fever and fistulas.

*Periurethral abscess* occurring as a complication of stricture, is due to the dilatation and thinning of the urethral wall behind the stricture with a leakage of urine into the tissues. Such a leakage may be very slow or moderately slow.

When very slow, an indolent hard mass forms in the cellular tissue outside the urethra, usually in the perineum, but slightly tender to the touch, attended by almost no constitutional symptoms. Such a slow leakage may cause a tumefaction of the perineum of the size of a golf ball or larger. (See Fig. 702.)

When the leakage is but moderately slow, the tissues become quite rapidly swollen and red. The constitutional symptoms are more marked, the temperature going up as high as 103° or 104° F. with a corresponding elevation of the pulse rate. The temperature and pulse take a septic curve, there is considerable pain and often difficult urination. The surface of the tumor is quite tender to the touch. At the end of a week or ten days the abscess either breaks or has to be opened.

*Extravasation of urine* is a much more rapid and dangerous complication. In this case there is a rupture of the urethra behind the stricture due to the passage of instruments, or some other traumatism. The urine, usually infected, extravasates into the cellular tissue under the superficial perineal fascia; the patient begins to have trouble in passing urine; the perineum begins to swell, which is followed by enlargement, edema and redness of the scrotum and penis; the tissues above the pubes also begin to swell; the scrotum becomes intensely red and dark areas of discoloration begin to show in the reddened tissues; the patient becomes septic and dies in a few days. Unless a patient with urinary extravasation is operated on shortly after the accident occurs, the sepsis may become so profound that no operation will save him. This condition is very rare, however. (See Ruptures of the Urethra.)

*Urinary Fistulæ.*—These are the results of periurethral abscesses that have broken externally and perineal sections that have not completely healed. There is usually but one fistula, although three or more may be present.

**Examination and Diagnosis.**—The diagnosis of urethral stricture depends entirely upon the examination. The patient should be placed on his back and the examination of the canal should be begun with a bougie à boule.

Strictures of Large Caliber.—These will first be considered, as they are more numerous. It is well first to take a bougie à boule No. 15 French, as this marks the size between strictures of large and small caliber. If this can be passed down to the bulb, any stricture existing in the canal is of a size larger than 15 French and consequently a stricture of large caliber. If it has not come in contact with a narrowing, one of larger size, say a No. 17 French, may be next introduced and then others, increasing every other number until an obstruction is encountered that does not permit the passage of that particular size instrument. The largest bougie à boule that passes through the stricture down to the bulb marks its size. After this, a sound of a similar size is passed through the urethra into the bladder. If it does not go into the bladder it shows either a spasmodic stricture or a false passage.

Fig. 727.—Bougie à Boule.

Spasmodic Stricture.—If a bougie à boule has passed down the canal for six inches, a deep anterior stricture is not present. In passing the sound in such a case, if its tip is made to hug the roof of the canal in the median line, it will probably pass through into the bladder. If it does not, and the stricture is of large caliber and the stream of urine of good size, it is probably spasmodic, especially if frequency of urination or frequency accompanied by tenesmus is present, in which case there is in all probability some acute congestion or inflammation in the posterior urethra, prostate or bladder. It is therefore advisable, in examining a case of stricture, to treat the patient for a while if there is much irritability present, and make a further examination later on when the symptoms are not so acute, meanwhile giving him local medication by urethral injections and internal treatment by diluents, antispasmodics and antiseptics.

It must not be forgotten, however, that injection of cocain into the anterior urethra and instillations of cocain into the posterior urethra and bladder, will usually relieve spasm and allow a urethral examination to be made, provided the instillation syringe can itself be introduced. Many patients have been operated on for an impassable stricture when it was simply impassable on account of spasm. I have personally failed to pass filiform through roomy urethras on account of a narrowing in the region of the bulb that I felt was spasmodic and have been able to pass a metallic guide of much larger size without difficulty when the patient was anesthetized. I will mention later an illustrative case, as the question of spasmodic stricture is a very interesting one. Parenchymatous and follicular prostatitis are accompanied by posterior urethri-

tis and give rise to painful and difficult urination and often retention. An attempt to pass instruments into the exquisitely sensitive posterior urethra may, in such cases, give rise to the contraction of the compressor-urethræ muscle, its protector. I have had many such cases that did not allow a filiform to pass and that, a little later under an anesthetic, allowed the passage of a large instrument.

The vesical sphincter contracts spasmodically when there is a congestion or inflammation behind it, especially tuberculous ulcers on the trigone or just behind the vesical sphincter, also a trigonitis due to a vesical calculus, tumor of the bladder and other conditions.

*Illustrative Case of Spasmodic Stricture.*—Some years ago the house surgeon of the Columbus Hospital telephoned me that a patient had entered with an impassable stricture, passing water in small quantities with great difficulty, and asking me if he could put him on the list for that day. When the case was brought in under ether, I easily went down to the bulb with the largest size bougie à boule and then passed the largest size sound into the bladder. The men present started to leave the room and some one asked: "Where is your stricture?" "Wait a moment," I replied, "and I will give you a lesson in urinary surgery. This is a spasmodic stricture and it is a principle that spasmodic strictures are due to congestion or inflammation near one of the sphincter muscles, the compressor urethræ or the vesical sphincter. The spasm in this case is of either one or the other of these muscles. A systematic examination of the patient has not been made. He is anesthetized and has a urethra of large size, therefore it will be easy to examine him further. I will first examine him by the rectum. This shows the prostate to be normal. A bimanual examination of the bladder shows the presence of something in its cavity or in the wall. If it is in the cavity, it is a calculus; if in its wall, it is a tumor. I pass a sound into the bladder—no stone is felt. I think it is a tumor of the bladder wall. I will open the bladder and see. Here is the tumor; anteriorly it extends up from the bladder neck on the anterior wall. The principle in this case has been proved correct. The vesical tumor was the cause of the spasmodic stricture. Now let us continue the operation and remove the tumor."

Very often in examining a urethra we come to a number of narrowings of different sizes. These should be duly noted as occurring at certain distances from the meatus, together with their sizes.

Stricture of the Meatus.—A stricture of the meatus is often found of small caliber. In this case we can only judge of narrowings along the canal that are smaller than the meatus and not those that are larger than it, unless a meatotomy is performed. It is therefore advisable in cases of chronic urethritis of long standing to cut the meatus to 32 French, to keep it plugged and to pass sounds through it until the end of the canal has healed to a larger size. A meatus cut to 32 French usually contracts two sizes in healing and the result

is an opening of 30 French. The remainder of the canal can then be examined, its size determined and any narrowings smaller than its normal size detected. The normal size of a canal with a large meatus is determined by learning the largest size bougie à boule that will slip smoothly through it without the use of force. Otis observed these difficulties that have just been enumerated and then drew certain conclusions which I have long since discarded, although, while working under him in the City Hospital, I considered them most important. They were then new, as was the very scientific instrument which Otis then used and which had caused world-wide interest.

Otis claimed that the size of the urethra is in proportion to that of the body of the penis and that a penis three inches in circumference should have a urethra of sufficiently large caliber to admit a No. 30 French sound. His table of the relative size of the urethra to the penis is as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Penis, | 3 | inches; | urethra, | 30 | millimeters; | 30 | French | scale. |
| " | $3\frac{1}{4}$ | " | " | 32 | " | 32 | " | " |
| " | $3\frac{1}{2}$ | " | " | 34 | " | 34 | " | " |
| " | $3\frac{3}{4}$ | " | " | 36 | " | 36 | " | " |
| " | 4 | " | " | 38 | " | 38 | " | " |
| " | $4\frac{1}{4}$ | " | " | 40 | " | 40 | " | " |

Otis at the same time invented an instrument called the urethrometer for measuring the inside of the urethra. This was a very scientific instrument, although one that I have not frequently employed on account of the difficulty in judging whether the urethra is distended normally or above or below its normal size.

The Otis urethrometer consists of a shaft with a wheel at the proximal end and a dial on the handle just below it. At the distal end, just behind the point, is a dilating arrangement consisting of a number of bands each with a hinged center. The mechanism of this instrument is as follows: By turning the wheel the bands are flexed, forming a spindle, and by watching the dial at the handle the number of millimeters of dilatation can be seen registered. The instrument is introduced with a thin rubber covering. The wheel is turned and the size of the urethra between the obstructions read on the dial; for instance, 30 mm. means that the urethra at this point is the size of a No. 30 French sound. The instrument is then drawn forward until it is caught against a stricture, when the wheel is reversed and then turned until the instrument slips through the obstruction. The size of the spindle when it is able to slip through the narrowing is the size of the stricture.

Strictures of small caliber are examined by means of bougies à boule as low as No. 6 French, the size of the smallest of these instruments. Below No. 6 French it is necessary to use either very small woven bougies or filiforms. If

none of the smaller instruments, such as sounds or woven bougies, pass, it is necessary to try filiform bougies.

A filiform stricture is one that admits only a filiform bougie. The manner of using these instruments is as follows: A single filiform, lubricated with

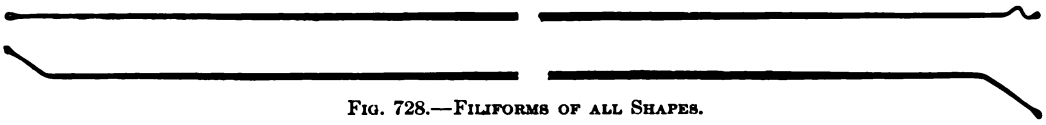


FIG. 728.—FILIFORMS OF ALL SHAPES.

glycerin or oil, is passed into the urethra, while the organ is held in an extended position. If this does not pass through the stricture, another one is slipped in beside it, and after this a number of others, one of which usually slides through the narrowing (Fig. 729). If, however, none of the filiforms introduced pass through the stricture, the entire number should be manipulated one after another by pulling each one up a little, then pushing it down again, by which means one usually passes through the narrowing.

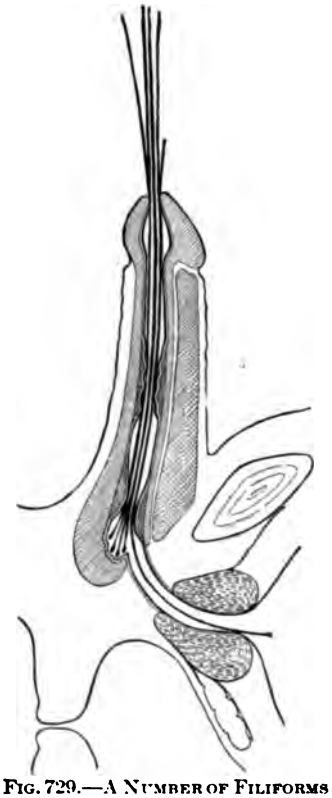


FIG. 729.—A NUMBER OF FILIFORMS IN THE URETHRA.

If none passes, it is advisable to give the patient the following preparation for another examination: Hot sitz baths twice a day; an antispasmodic, as tincture of belladonna 8 drops, or tincture hyoscyamus 15 drops; a urinary antiseptic, as urotropin grs. 8 t.i.d. or sodii benzoate grs. 15, together with an alkaline diuretic, as potassium acetate grs. 15, with sweet spirits of niter grs. 15 t.i.d. Instruct him to abstain from all alcoholics and from coitus, and to keep his bowels open with saline laxatives. The probabilities are that, when the patient next returns, it will be possible to pass a filiform through the stricture. If it is not possible, however, it can probably be accomplished if the patient is kept in bed for a few days.

Of course, this applies to patients who can pass urine, for it must be remembered that there are two kinds of stricture patients: First, those who can pass urine and yet it is difficult to pass anything through their urethras; and, second, those who cannot pass urine and into whose bladders an instrument can easily be passed.

Sir Henry Thompson once said that, in the twenty years of his most active practice, he had had but six patients in whom he could not enter the bladder

and four of these suffered from stricture. Personally, the longer I practice urinary surgery the fewer cases I find where I have to operate without having first passed some kind of a guide through the canal. In other words, I have learned to be much more conservative, more careful and more painstaking with my patients than formerly. This has resulted from having observed the superior results obtained by operating on patients whose urethras I had thoroughly examined and passed guides through the obstructions before operating, whereas formerly, when I could not pass the guide, I was in the habit of making the more "showy" operation without it.

In filiform strictures these instruments catch in certain places along the canal. They rarely catch in the first five inches and when they do it is usually easy, by introducing others in the manner just described, to pass through the stricture. Occasionally they stick in strictures in front of the bulb (Fig. 730) and cannot be made to pass through the stricture as far as the bulb. If a filiform can only be passed as far as the bulb, it has probably gone into a pocket; by this I mean that a filiform that has passed six or six and a half inches into the canal has not penetrated the membranous urethra, but has been sidetracked.

Fig. 730.—Stricture Formation that Tends to Deflect a Filiform into a False Passage about an Inch in Front of the Bulb.

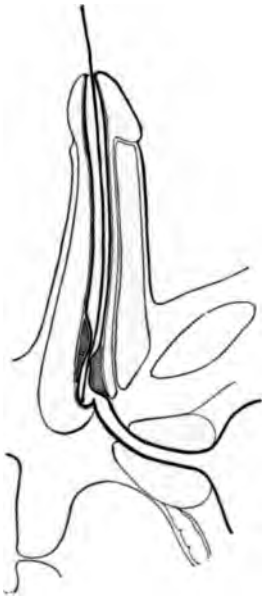


Fig. 731.—Stricture Formation that Tends to Deflect a Filiform into a Pocket in the Bulb. It catches at 6 or 6½ inches.

Pockets and False Passages.—In the pendulous and scrotal part of the canal they are generally situated in the floor of the urethra, which is more pliable and distensible, and are due either to dilated urethral follicles or to the mucous membrane having been pushed through between the muscular bands of

the urethral wall. In the perineal or bulbous portion they are usually due to the mucous coat of the lower wall having been pushed beyond the anterior layer of the triangular ligament. Naturally, not all pockets are along the floor of the canal, as all men who do urethral work have found them on the roof and sides as well. It is often exceedingly difficult in these cases to pass through the strictured portion, because every instrument introduced tends to slip into these culs-de-sac. We know that by hugging the roof of the canal we should be able to pass through the narrowing without difficulty. Frequently, however, one is unable to accomplish this on account of irregular stricture deposits on the upper wall, even in the anterior urethra in front of the bulb, that tend to deflect the instruments from their course. It is therefore advisable to try with a number of filiforms in the manner already described.

Fig. 732.—Stricture Formation that Allows a Filiform to Pass only with its End Bent at a Double Right Angle.

Fig. 733.—Stricture Formation Best Passed by a Filiform with a Corkscrew Twist.

If a filiform with an end bent at a double right angle is passed up to the stricture and then manipulated, it may be made to pass (Fig. 732). In other

cases, if a filiform with a corkscrew end is introduced and twisted about, it will often worm its way through the strictured part of the canal (Fig. 733).

If a filiform passes down for seven inches and then sticks, it has probably caught in the prostatic urethra (Fig. 734), in a prostatic follicle, in a depression in the urethra caused by a prostatic abscess, or in an irregularity in the floor of the prostatic urethra due to some former suppurative or tuberculous condition that has changed the contour of this portion of the canal. In the case of prostatic hypertrophy, it will have caught against the curve in the prostate due to its deformity. Therefore, all filiforms that go beyond the bulb of the urethra and stick farther down than six and a half inches or more have probably gone into the prostatic portion and have encountered some obstacle which has prevented further progress in a region where there is really plenty of space. Sometimes when one filiform has caught in the posterior urethra others passed along its side will enter the bladder.

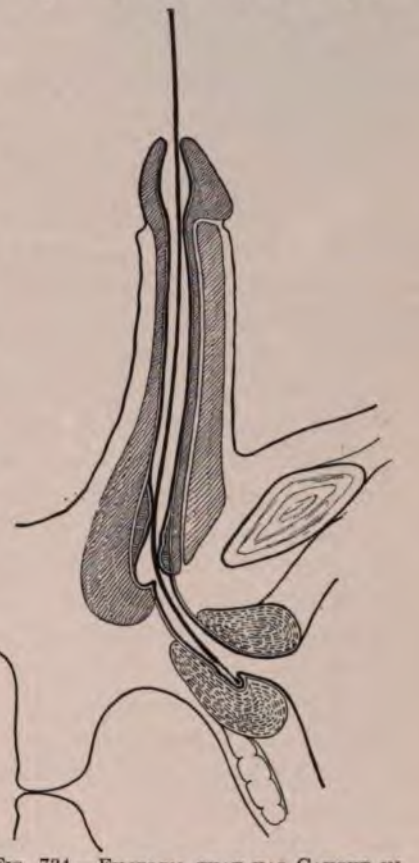


Fig. 734.—Filiform that has Caught in the Prostatic Urethra. It therefore catches at seven inches or more down the canal.

In examining a urethra, it is never wise to pass a tunnel sound over a filiform, unless it is just before an operation. In the case of a filiform obstruction of the posterior urethra, a tunnel sound or catheter passed over it often lifts its end out of the lodging place and takes it into the bladder. This may also happen when the filiform has stuck in the bulbous portion of the canal, or in a pocket just in front of the bulb. At other times, if the filiform is pulled up slightly, the end of the tunnel sound becomes disengaged and passes through the remainder of the urethra.

**Differentiation.**—The differential diagnosis between stricture and prostatic affections is generally very easy, although I have seen the most unusual mistakes made.

Let us first take HYPERTROPHY OF THE PROSTATE. This occurs in men over fifty-five years of age, whereas the majority of stricture cases are in patients under forty. *Frequency of urination* is a prominent symptom, but this occurs in prostatics with greater relative frequency during the night than during the day, whereas in stricture the relative frequency is greater during the day.

Dividing day and night into two periods, the day sixteen hours and the night eight, the prostatic will urinate five times during the day and four during the night, whereas the stricture case might urinate eight times during the day and once during the night. A few years ago I had a man seventy-two years of age sent to me for prostatectomy. On examination by rectum, I found that he had no prostate. His urethra showed an impassable stricture at five and a half inches. It was a difficult case to operate. After completing the external urethrotomy, I palpated his prostatic region bimanually, one finger in the rectum and the other in the prostatic urethra. There was only thin tissue between the two fingers. The prostate had been entirely destroyed. I have mentioned this case before as a peculiar case; but it will bear repetition as a lesson in diagnosis. Not only could no prostatic tissues be felt, but there was no thickening to represent the prostatic capsules and ejaculatory ducts.

*Retention of urine* is the second reason why these two troubles are mistaken for one another. Examination shows the obstruction in stricture in the anterior urethra, whereas in prostatic cases the obstruction is in the posterior urethra, besides which the obstruction in stricture is much narrower than that in prostatic hypertrophy. A coudé (elbowed) catheter usually easily overcomes the obstruction in the prostatic.

Acute parenchymatous prostatitis is also mistaken for stricture. In such a case, the symptoms of frequent and difficult urination have been present but a few days. They have occurred during an attack of acute urethritis. The trouble is accompanied by a fever and the prostate can be felt by the rectum to be enlarged. An attack of acute retention may be present, due to the prostatitis alone or the development of an abscess in the prostate. I have had a number of such cases sent to me as those of stricture with retention.

Acute follicular prostatitis is often mistaken for stricture of the urethra on account of symptoms of frequent, difficult and painful urination and also complete retention. In these cases there is often a spasmodic stricture of the compressor-urethræ muscle due to the extreme tenderness of the prostatic urethra just beyond it, leading one to believe that it is an impassable stricture. I have had patients with this trouble in whom catheterization had to be repeated a number of times, and have finally tied a catheter in to overcome the spasm.

Tuberculous cystitis also resembles stricture in frequency of urination, pain and tenesmus, but in tuberculosis the frequency is about the same day and night, whereas in stricture the frequency is much more marked during the day The examination of the urethra in tuberculous cystitis does not show any obstruction until the bladder is reached, when there may be a spasmodic contraction of the vesical sphincter due to the very tender trigone beyond it.

Calculous cystitis resembles stricture more than either prostatic conditions or tuberculosis, as in both troubles there is relatively greater frequency

during the day than during the night. The passing of instruments is sufficient for the diagnosis, as in the case of stone the urethra admits a good-sized sound, the contact of the instrument with the stone in the bladder is felt and the cystoscope shows the calculus.

Seminal vesiculitis also resembles stricture, as there is more frequency by day and there is besides, in both troubles, a feeling of bladder fullness. In the case of seminal vesiculitis, the urethra is of good size, but the vesicles are felt per rectum to be enlarged and tender. Massage of the vesicles usually empties them and relieves the symptoms. This will be referred to again under Diseases of the Vesicles.

**Prognosis.**—The prognosis of strictures of small caliber that are not treated is bad, as severe chronic cystitis results, followed later by pyelitis and pyonephrosis. Strictures that are soft can easily be cured by dilatation, followed by silver irrigations after each stretching, together with astringent injections at home. Small anterior strictures in the scrotal and pendulous portions of the canal that cannot be dilated should be operated by internal urethrotomy, which should be followed by dilatations and irrigations of silver-nitrate solutions every other day until the patient is cured. Strictures of small caliber in the perineal part of the urethra that are not dilatable should be operated by external urethrotomy and then treated in the same way as the more anterior strictures. Strictures of small caliber present at the same time in the perineal, scrotal and pendulous portions of the urethra that do not dilate should be operated by both internal and external urethrotomy. If this is done, the prognosis for longevity is good.

If the patient is allowed to go on without treatment until the kidneys have become infected, the prognosis for longevity is bad, even if the strictures are then cured, as the inflammatory changes that have taken place in these organs have permanently disabled their functions in a greater or less degree. It therefore behooves every patient with stricture, who desires to assure his longevity, to place himself under immediate treatment by dilatation or by operation, as the case indicates, until he is pronounced cured by his physician.

**Treatment.**—Patients suffering from urethral stricture come to us usually, complaining either of a chronic urethritis, frequency of urination or attacks of retention. The examination that we have already outlined shows the presence of stricture at the meatus or farther down the canal. The treatment of these cases for their radical cure is to dilate all strictures that are dilatable and cut those that cannot be dilated.

For the dilatation of strictures, we use dilators, sounds and bougies. There are two varieties of dilators, the Oberländer and the Kollmann, that have already been spoken of in the chapter on the Technic of Instrumentation (Vol. I) and again under Chronic Urethritis. These dilators can be used only in cases of strictures of large caliber, as the Oberländer is of size No. 15 French and larger

when the rubber sheath is on, whereas the Kollmann is No. 22 French and still larger with the sheath.

The Oberländer is a two-bladed instrument which dilates the canal antero-posteriorly, and is constructed after the model of the curved Otis urethrotome. It is inserted with a rubber covering and is capable of dilating strictures both of the pendulous and bulbo-membranous portions of the canal. The dial at the handle end of the upper surface registers the amount of dilatation, each point corresponding to a millimeter. It is well to alternate with sounds, the patient calling for treatment every second day.

The Kollmann is a four-bladed dilator which dilates antero-posteriorly and laterally at the same time. There are several types of the Kollmann, one for dilating the anterior urethra, another for the posterior urethra and a third for the antero-posterior urethra. As the posterior urethra is larger than the anterior and the strictures giving rise to urinary disturbances are nearly always in the anterior part, a dilator that will stretch this portion of the canal is the most serviceable one in stricture cases; whereas the posterior dilator can be used to better advantage in prostatic troubles. As I believe in the dilatation of the entire canal at the same time to make it uniform, I can recommend the antero-posterior Kollmann dilator, and in speaking of the Kollmann instrument, I will refer to the antero-posterior dilator, unless the other varieties are specified. Kollmann dilators are also made with blades that fit into each other in such a way that no sheath need be used, besides which there are also dilators made in this way that have an irrigating apparatus. The sounds recommended are those with the short curve.

I. Strictures of Large Caliber.—These will first be considered, as they are of a size above No. 15 French and can be more easily dilated by both dilators and sounds; whereas in the treatment of strictures of small caliber, which are below No. 15 French, dilators cannot be made to pass through the narrowings. A 16 French stricture is the smallest size through which the Oberländer dilator can be passed, and therefore, in using this instrument, it is necessary to continue with it until the narrowing has been dilated to 23 French before beginning with the Kollmann.

*Technique of Dilatation with the Oberländer Dilator.*—The technique of using the Oberländer is simply to pass it, lubricated with glycerin or with some other of the lubricants that are soluble in water, in the same way as a sound is introduced. After it has been introduced, the wheel at the proximal end is turned and the arrow on the dial is watched until a number is reached that appears tight to the patient. This is sufficient for the first dilatation. It should be noted whether the patient bleeds or not, as bleeding is a sign of too much dilatation and generally occurs when there is an inflammation about the stricture, or a granular or ulcerative condition of the urethra.

In anterior strictures, if there are symptoms of posterior urethritis, it is

not necessary to introduce the Oberländer into the bladder or to dilate the posterior urethra, but simply to pass it down until it is at right angles to the table and hold it in this position while the dilatation is being made. At each dilatation, which should not be oftener than once every two days, one or two millimeters of increase, as shown by the figures on the dial, is usually made, depending on the dilatability of the narrowing. We must bear in mind, also, that if we dilate too forcibly, we cause more traumatism to the urethra than is necessary and may hinder the cure of the disease. The urethra is then irrigated.

When a dilatation up to 23 French has been arrived at, the Kollmann dilator can be brought into use. If the meatus is too small for the passage of this instrument, a meatotomy should be performed up to 32 French. It is claimed for the Oberländer, as an argument in its favor, that it can stretch the urethra in cases having a small meatus. This may appeal to some in favor of the Oberländer, but personally I prefer a large meatus. Some say that, when a meatus is enlarged, the nozzle of the canal has been destroyed. It has not been destroyed, but made larger, and if a meatus is so tight that it does not dilate naturally when the stream of urine flows through, it should be enlarged, by performing a meatotomy, until it has reached the size of the remainder of the canal.

*Technique of Dilatation with the Kollmann Dilator.*—Assuming that the meatus of the patient is of good size, 28 to 30 French, or has been cut until it has been made sufficiently large, the Kollmann is introduced into the bladder, and dilatation performed in the same way as by the Oberländer. If, however, the posterior urethra is much inflamed or very irritable, we should use dilatation with the instrument perpendicular to the body, as I have described it in connection with the Oberländer. In case the Kollmann is used with the sheath, the same urethral or urethro-vesical washes and irrigations are used after the dilatation as with the Oberländer. But in case the irrigating Kollmann is employed, the irrigating nozzle is connected with a fountain syringe or other reservoir and the urethra washed out while the canal is dilated.

Dilatations with the Kollmann are made from 28 to 30 French, or larger, depending on the size of the urethra in question. Sounds are used when the chronic urethritis is obstinate, if one does not have the dilators.

The Kollmann dilator is a better instrument for the membranous urethra and the triangular ligament than is the Oberländer. In dilating strictures, I always use both the antero-posterior Oberländer and Kollmann dilators.

A tender posterior urethra is due to congestion or inflammation of the posterior urethra or the prostate and will be much relieved by the dilating of the strictures, as consequently the posterior urethra can itself be dilated if necessary later.

*Treatment Accompanying Dilatation.*—These dilatations should be followed by washing out the urethra with a solution of nitrate of silver, 1 : 4,000 to

1 : 2,000, either by a urethral hand syringe, or by means of a bladder piston syringe, or a fountain syringe with or without a catheter.

It is well, in cases in which there is a posterior urethritis present, or where there are signs of bladder irritability, to treat the posterior urethra by instillation of silver, beginning with 1 : 500 and increasing the strength with each sitting to 1 : 400, to 1 : 300 and so on, until the symptoms are relieved; or else by passing the catheter into the bladder after the dilatation, filling it with a silver solution and allowing the patient to void it immediately afterwards. Such urethral-bladder washings through the catheter, or by hydrostatic pressure, are indicated if cystitis is present.

The *astringent injections* that have been specified for the treatment of chronic urethritis are used by the patient at home three times a day while this treatment is going on, in case a chronic urethritis is present, as it usually is.

It is advisable, while the patient is undergoing a course of treatment by dilatation, that a urinary antiseptic such as urotropin (7½ or 10 grains at a dose) be used three times a day, in powder, tablet or solution. Capsules of benzoic acid can also be used if the urine is alkaline, as can oil of wintergreen or eucalyptol. If, however, the urine is acid, benzoate of soda is preferable. Tincture of belladonna 7½ minims to 10 minims, or tincture of hyoscyamus 15 minims, may also be taken in cases of bladder irritability. As there is often frequency of urination in these cases, the following prescription is advisable:

℞ Tinct. belladonnæ ..... ♏ vijss;
Urotropin ..... grs. vijss;
Sodii benzoate ..... grs. xv;
Aq. gaultheria .....ad ℥j.

M. S.: Such a dose to be taken three times a day, between meals, in a glass of water.

II. Strictures of Small Caliber.—Strictures of small caliber, below 15 French in size, are much more difficult to treat than are those of larger caliber, for here dilators are of no service on account of their large size. It is necessary, therefore, to confine ourselves to sounds and bougies.

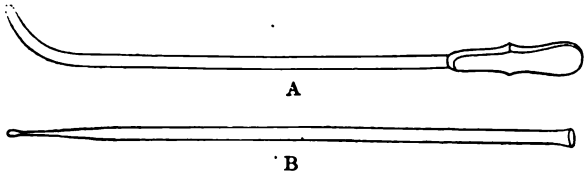


Fig. 735.—Sound (*A*) and Bougie (*B*).

*Sounds.* — The sounds that I have found most serviceable in the practice of urethral surgery are the ones with the short curve, slightly tapering toward the end, but with an end that is well rounded, as one that is too pointed tends to catch in the irregularities of the strictured canal and cause traumatism and false passages.

The sounds used in the treatment of small strictures are of but little value for gradual dilatation when below the size of No. 8 French, as they are not sufficiently heavy to glide in by their own weight and have to be guided, perhaps with a slight amount of force, through the canal. As these sounds are necessarily quite sharply pointed, they are liable to lead to the formation of a false passage in the hands of an unskilled practitioner with an inexperienced touch.

The *passing of sounds* is performed in the same way as that of the dilators and is also explained in the chapter on the Technique of Instrumentation (Vol. I). On the Continent, the surgeons, in passing sounds, stand on the patient's right. In this country, most of us working in urethral surgery stand on the left, and personally, I feel that it is easier for me to pass them when standing on the left than on the right side.

The smaller the strictures and the more irregular the canal, the more liable the patients are to have pockets, such as have just been described under The Examination of Strictures. These pockets are usually made by passing an instrument along the floor of the canal, which is not such a straight path to the bladder as is its roof. The principal urethral pocket is in the bulbous portion, just below the entrance to the membranous urethra. In strictures of small caliber, considerable back pressure is brought upon the bladder and the posterior urethra, resulting in congestion or inflammation, together with irritability, of these two portions of the urinary canal. Therefore, if a sound is introduced into a urethra in these cases, when it arrives at the external sphincter, the compressor urethræ (or cut-off muscle), which is the guardian of the prostatic urethra, contracts. This closes the door to the posterior portion of the canal, which is usually tender in these cases, and as a result the end of the instrument comes in contact with the back of the floor of the bulb. If the practitioner, who is endeavoring to pass a sound, is not familiar with the behavior of the external sphincter muscle and does not bear in mind its tendency to close and the possibilities of the end of the sound coming in contact with the end bulb below it, he may, in his effort to introduce the sound into the bladder, push the instrument in the end of the bulb in such a way as to stretch it or even to puncture it. Continuous efforts to pass an instrument in these cases often result in a sufficient stretching of this portion of the canal, to be known as a false passage; whereas an increased amount of force, sufficient to pierce the tissues and enter the prostatic urethra by going around or through the compressor urethræ muscle, could cause a complete false passage that might be permanent.

It should therefore be remembered that one of the most important rules in urethral surgery is to go by the straight path into the posterior urethra and bladder, through the natural gateways. This is done by hugging the mid line of the roof of the urethra and, on arriving at the cut-off muscle, if it is in a

state of spasm, either to desist from passing the instrument farther, or else to press the sound gently against its opening until the spasm is gradually overcome and allows its entrance. Some surgeons place their finger against the perineum when the sound is being introduced, so as to hold it up against the roof of the urethra and prevent it from being pushed into the floor of the bulbous portion of the canal. It must be remembered, however, that there are often areas of thickening on the roof of the canal that tend to throw the end of an instrument away from it, down onto the floor of the bulb. (See Fig. 731.)

At any rate, after a sound has been passed through a urethra of small caliber, of whatever size it may be, it should be allowed to remain in place for ten minutes, then withdrawn and an instrument one size larger introduced to see if it will also pass through the canal. If not, further dilatations should be postponed until the next visit, when the same sound, or the one next larger in size, is introduced. Personally, I generally pass the same sound first, the next size afterwards. If I find, however, that the first sound passed produces a spasm after it has entered and another sound cannot be introduced, I use but one sound, that of a larger size, on each succeeding visit. With care and patience, it is possible in strictures that are not too fibrous to increase the size of the canal gradually to 16 French, when the Oberländer dilator can again be brought into use. This is very serviceable in dilating the narrowing from this point until the Kollmann dilator or large-sized sounds can be brought into use.

*Bougies.*—In many cases in which a metal sound catches along the urethra, the olivary-tipped woven bougie of very small size can be made to worm its way through the strictures. In case it does, one of larger size can be passed on the following visit and dilatations of the urethra can be continued in this way until sounds or a dilator can be brought into play. If, however, an olivary bougie of a size larger than the one last introduced cannot be passed on the next or succeeding visits, it is well to have the patient remain at home with the largest olivary-tipped bougie that can be passed retained in the urethra for twenty-four hours, at the end of which time it should be withdrawn and probably one of a larger size be introduced. This is called the continuous method of dilatation, and will be spoken of again later.

*Béniqué Sounds.*—The Béniqué sound is of great value in gradual dilatation of small strictures, but its use is not appreciated in this country. It is more used in France, where its value is well known. The Béniqué sound is passed at the end of a small guide. This guide resembles a filiform bougie in size, although it is made of woven material. It has on its proximal end a screw, while the end of the Béniqué sound has a screw eye. The fine filiform guide is first passed into the bladder, the sound screwed onto its proximal end and then made to follow the guide into the bladder through the entire urethral canal. This sound can then be withdrawn and unscrewed, and one of

the next size attached to the guide in a similar way and introduced if the canal is sufficiently large. It is, of course, never advisable to use undue force in passing this instrument, and thus cause traumatism of the canal; but after the largest instrument that can easily be made to follow the guide into the

Fig. 736.—Béniqué Sound, With and Without Filiform Guide.

bladder has been passed, the sound should be allowed to remain in ten minutes or more. After this, it should be withdrawn and another treatment of the same kind given two or three days later.

III. Filiform Strictures.—Filiform strictures are familiar to us, as they have already been described under Examination in the preceding chapter. They are strictures through which nothing larger than a filiform can pass without force. Sometimes it is necessary to pass a number as far as the impediment and then manipulate them for some time before one goes through the stricture. Filiform strictures usually have to be operated upon. They can at times, however, be dilated to a large size. It seems incredible that a filiform stricture, which is 3 or 4 French, can ever be so dilated that a No. 30 French sound can be passed through it. But this often takes place. Sometimes we pass a filiform on one visit and a very small bougie on the next visit, or else a guide to a Béniqué sound, after which we can pass the sound itself through the stricture and begin gradual dilatation. Filiform strictures do not usually allow the passage of a small Béniqué. It is more probable that a small bougie can be introduced, in which case it is allowed to remain in for twenty-four hours.

*Continuous Dilatation.*—If the patient is able to urinate and a small bougie cannot be passed—in fact, nothing larger than a filiform—after repeated trials, the filiform should be retained for twenty-four hours, at the end of which time a very small bougie will probably pass. In case it does not, however, the filiform can again be introduced and one or two more filiforms may be passed beside it, all of which can be allowed to remain for another twenty-four hours, when, perhaps, a very small woven bougie will enter. The continuous pressure of the filiform or filiforms or that of the very small bougie on the stricture,

as well as the passage of the urine beside these instruments, tends to cause some absorption or atrophy of the stricture tissue, so that further dilatation can be successfully employed. If, however, these manipulations fail, the case is an operative one. When filiforms or very small bougies are allowed to remain in the urethra for twenty-four hours or more, the character of the dilatation is spoken of as continuous.

IV. Impassable Strictures.—An impassable stricture is one through which a filiform does not pass after repeated attempts. It is usually temporary and depends on congestion and spasm. It is rare that a stricture continues impassable if we follow certain steps which have just been outlined under Examination of Stricture.

I do feel, however, that I cannot repeat too often the important influence that a certain treatment has on strictures of small caliber, in the carrying out of which the patient should coöperate with the surgeon. This treatment can be summed up in a few words: The reduction of congestion and spasm. The patient, if attending to his usual duties, should be careful in cold weather to have warm clothing on his legs and also warm footwear. He should avoid draughts and the wetting and chilling of the lower extremities. He should not indulge in alcoholics or coitus. He should take two hot sitz baths a day and three times a day a mixture containing fifteen grains of the acetate of potash and half a drachm of sweet spirits of niter. He should drink three quarts of water a day. Tincture of belladonna ♏ vijss or tincture of hyoscyamus ♏ xv should be given in the way already described. Such treatment tends to diminish the congestion and spasm.

It is advisable, however, in a case of impassable stricture, to keep the patient in bed when this treatment is employed. In this way I have been able to pass filiforms through many strictures that I might otherwise have not been able to conquer. But generally these impassable strictures, if not due to spasm, become filiform strictures of the operative class. It is better, however, to have a urethra in such a condition as to be able to pass a filiform guide before an operation, than one that does not admit a guide; though sometimes on the operating table a filiform bougie will go through a patient's canal after he is under the anesthetic, which would not enter before the anesthesia.

# CHAPTER LIX

## OPERATIONS FOR STRICTURE OF THE URETHRA

As I said, all strictures that can be cured by dilatation should be treated in this way; whereas those that cannot be dilated should be cut. The strictures, therefore, that will now be considered, are those that cannot be satisfactorily cured by dilatation. The operations for stricture of the urethra are meatotomy, internal urethrotomy, external urethrotomy and combined internal and external urethrotomy. We will first consider meatotomy and then the operations for anterior stricture of large caliber, that is, over 15 French.

### MEATOTOMY

Meatotomy is one of the simplest and at the same time one of the most important operations in minor surgery. It is by far the most important minor operation in urethral surgery. We frequently see patients, the caliber of whose urethra is 30 French and yet whose meatus or a congenital stricture just behind it is from 16 to 20 French, showing the strain that is brought upon the tissues behind by the stream suddenly striking this impediment. The best method of performing this operation is first to inject a four-per-cent solution of cocain into the urethra; then to inject a few drops of the same strength into the floor of the fossa navicularis and into the floor of the urethra between the fossa navicularis and the meatus. Then a two-bladed urethral speculum is introduced (Fig. 737) and opened as far as possible. The organ and the blades of the urethral speculum are held perpendicular to the body. If the stricture is situated just behind the meatus, of a congenital nature, it can be seen as a white band, stretching across the floor of the canal. A knife with a thin sharp blade (Fig. 738) is introduced and a straight vertical cut made in the median line, corresponding to the frenum (Fig. 739). A sagittal

Fig. 737. Fig. 738.

Fig. 737.—A Urethral Speculum.
Fig. 738.—A Meatotomy Knife.

section of the organ shows the cut in the meatus (Fig. 740). A sound is then introduced for an inch or more to see what size has been obtained by the

FIG. 739.—SPECULUM IN PLACE AND THE KNIFE IN THE ACT OF CUTTING THE MEATUS, FRONT VIEW.

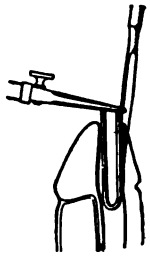


FIG. 740.—SIDE VIEW OF SAME OPERATION AS FIG. 739.

FIG. 741.—MEATOTOMY ON A GROOVED DIRECTOR.

operation. If a No. 32 French is admitted, then the operation is complete. If, however, it is only No. 25 or No. 26, the speculum is again introduced and it is enlarged until the tip of a No. 32 sound can be passed for an inch or more. Sometimes a urethral speculum cannot be introduced into a small meatus, in which case a probe-pointed grooved director is passed down the canal with the groove pointing toward the frenum. The organ is then steadied and the back of the knife passed down the groove for a short distance and then a cut is made toward the frenum (Fig. 741). If this is not sufficient, the speculum is introduced and the meatotomy completed as just described.

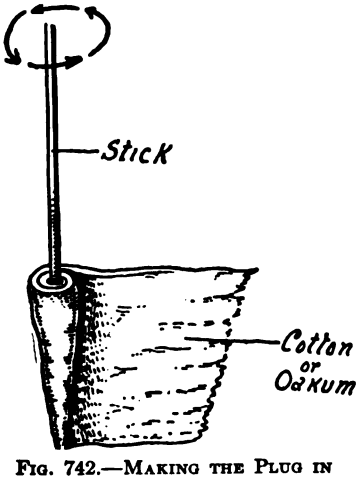



FIG. 742.—MAKING THE PLUG IN MEATOTOMY.

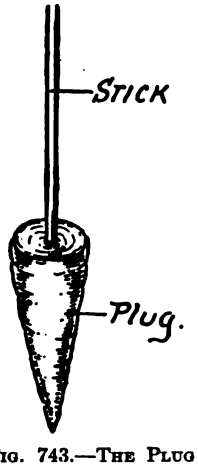



FIG. 743.—THE PLUG MADE.

FIG. 744.—THE PLUG IN SITU.

After the meatotomy, the bougie à boule is passed down the anterior urethra to ascertain the presence of other strictures and their size. After the operation, the urethra is washed out with a solution of nitrate of silver 1 : 3,000 and a plug inserted into the urethra. These plugs are usually made by means of a straw or toothpick about the end of which a piece of cotton is wound (Fig. 742), making a cone-shaped plug (Fig. 743). This is dipped into vaseline

and inserted into the meatus (Fig. 744) after each micturition. It prevents the sides of the wound from growing together. Sounds are passed through the cut portion every day until they cease to cause bleeding, after which the plugs are dispensed with. The urethra is washed with a 1:3,000 silver solution each time after passing sounds.

## URETHROTOMY

In doing urethral surgery, it is a pleasure to say that no instruments have proved of as much value to me as the urethrotome of Otis and the tunnel sound of Gouley, and I feel that all of us who do much operating in this line cannot pay too high a tribute to these two great operators in urinary surgery. Maisonneuve certainly devised a most ingenious urethrotome, and it is difficult to imagine one which can do so much under certain conditions as the Maisonneuve instrument. Every year, however, I use it less and less and rely more and more on the Otis and Gouley instruments.

**Internal Urethrotomy.**—Internal urethrotomy can be performed on strictures of large caliber and of small caliber.

Strictures of Large Caliber.—The strictures of large caliber are operated upon in the anterior urethra from the meatus to within an inch of the bulb, usually in the pendulous and scrotal portions of the canal. The Otis urethrotome, which is of two sizes, from No. 15 to No. 18 French, is employed, whereas in stricture of small caliber, below 15 French in size, the Maisonneuve is employed. Even if the strictures were located when the patient was first examined, it is advisable to examine the urethra again with the bougie à boule just before operating.

*Otis Urethrotome.*—The Otis urethrotome consists of a shaft made of two pieces of steel which are joined together near the distal end by a hinge and which have between them small levers. There is also a knife composed of a

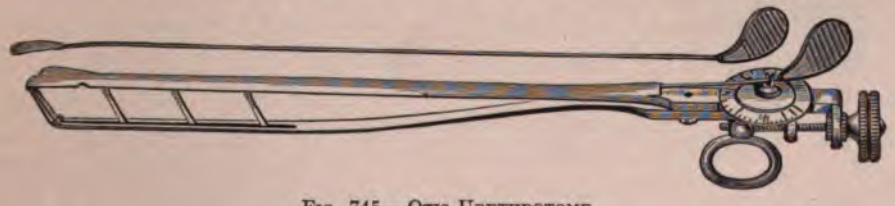


Fig. 745.—Otis Urethrotome.

wire shaft with a small cutting blade on its end, which is pushed along a groove in the upper piece of the urethrotome until the blade disappears from sight near the end of the shaft. On the proximal end or handle end is a wheel and a dial. The turning of the wheel works a screw which in turn separates the two parts of the shaft and moves an arrow on the dial that registers the amount of dilatation.

*Preparation of the Patient.*—Preparation of the patient for internal urethrotomy consists in giving salol grs. 5, or urotropin grs. 10, three times a day for three days preceding the operation, to be continued for three days after operation. A cathartic is given on the evening preceding the operation and the bowel washed out just before the patient is brought to the operating room. The patient should then pass urine, if he is able to, and his urethra and bladder are washed out with a saturated solution of boric acid, about six ounces of which are allowed to remain in the bladder. A syringeful of four-per-cent cocain solution is then injected into the urethra with a hand syringe holding about three drachms, and is held there for five minutes by the O'Crowley urethral holder to allow perfect anesthesia of the urethra to be produced.

*Technique of Instrumentatoin.*—The Otis instrument is passed down the urethra so that its tip is an inch below the stricture. The organ is held perpendicularly to the body by the assistant, between the thumb and forefinger, in such a way that the finger tips point toward the patient's head. It is held on the stretch and is not too tightly grasped. The instrument is held at right angles to the body by the operator. The wheel at the proximal end is then turned and the urethra is dilated until resistance is felt. It is not advisable to dilate the canal to the size to which one wishes to cut the stricture, if great resistance is offered, as in this way the operator may rupture the canal. Having dilated until the stricture is fully stretched, the dial on the instrument should be looked at to note the size that has been reached. The knife handle is then drawn upward sufficiently to allow its blade to cut through the stricture and it is then pushed back again into its hiding place in the end of the instrument (Fig. 746). If there are any other strictures anterior to this to be cut, the instrument is brought to the next one and the same procedure is carried out, and then to the next. In case the meatus is small, a meatotomy should have been performed before the urethrotomy, but in case the step was overlooked, it should now be attended to. The instrument is then passed down the canal again and the canal further dilated in the same way as by an Oberländer dilator—by turning the wheel at the proximal end and watching the arrow on the dial. It will then be noticed that the resistance is much less and that the cutting of the strictures has made it possible to dilate them to a greater size without much resistance.

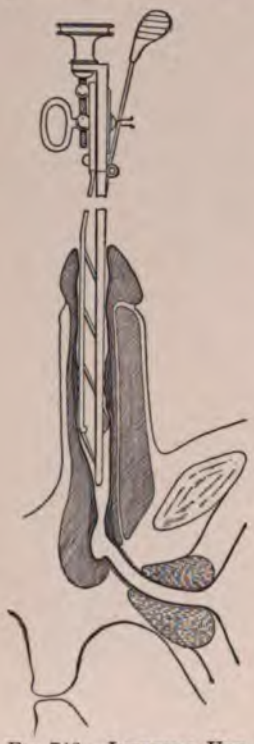


FIG. 746.—INTERNAL URETHROTOMY BY THE OTIS METHOD.

The urethrotome is then withdrawn and sounds are passed, beginning with

the sound representing the size to which the strictures have been cut. If the sounds can be passed up to the size desired, that is, to that of the healthy part of the canal, the operation is completed; but if a sound representing the normal size of the canal does not pass through the entire urethra without force, the bougies à boule are again passed. In this way we will learn the condition of the strictures that have been cut, as perhaps one of them may have been more resistant than the others and will have to be cut to a further degree. In this case the urethrotome is again introduced and that particular stricture is cut to a larger caliber. The urethral cut is in the dorsal mid-line.

It is perhaps wiser when examining strictures to note the one which is smallest, in case several are present, and to cut that one first, after which the others may be cut according to their size. Usually, after cutting strictures to a moderate degree, sounds can be passed immediately after the withdrawal of the urethrotome up to No. 30 or 32 French. Very forcible dilatation of the urethra and the forcible yanking of a knife throughout its entire length gives rise to scar tissue, and perhaps later to a bending of the organ during erections, thus making its dorsum convex, as in the case of chordee. This bend, usually, disappears slowly in time.

By injecting boric-acid solution into the bladder before the operation and giving urotropin internally before and after the operation, I find that the chills and rise of temperature are not so apt to follow the first passage of urine after the urethrotomy. Sounds are passed every two days for the first week after the operation, followed by a washing of the anterior urethra by a nitrate-of-silver solution (1:4,000 to 1:2,000) through a catheter inserted down to the bulb, or by hydrostatic pressure with but slight elevation of the reservoir. Then for two to four weeks they are passed twice a week, while later the passage of sounds will depend on the persistence of the chronic urethritis and the tendency of the strictured areas to again contract. When these two conditions have been overcome, the treatment is discontinued, although the patient should return once a week for three months for observation, at which time sounds should be passed. When there are gonococci present, an injection of protargol (1:200) is employed while the sounds are being used; but after their disappearance, an astringent injection is given as long as the discharge continues.

Anterior Strictures of Small Caliber.—When strictures of small caliber cannot be dilated, they should be cut by the Maisonneuve urethrotome. The *Maisonneuve urethrotome* (Fig. 747) is No. 9 French in size and can therefore be introduced through very tight strictures. It is a metal instrument, shaped like a thin sound with a small distal end. The small tip at the extreme point of the distal end can be removed by unscrewing it, showing a screw at its end that can be screwed into the screw eye on the proximal end of a small woven catheter resembling that used with a Béniqué sound and about

the size of a filiform bougie. On the upper or concave surface of the urethrotome is a groove running from the distal to the proximal end of the instrument. This groove is for the reception and direction of a triangular-shaped knife situ-

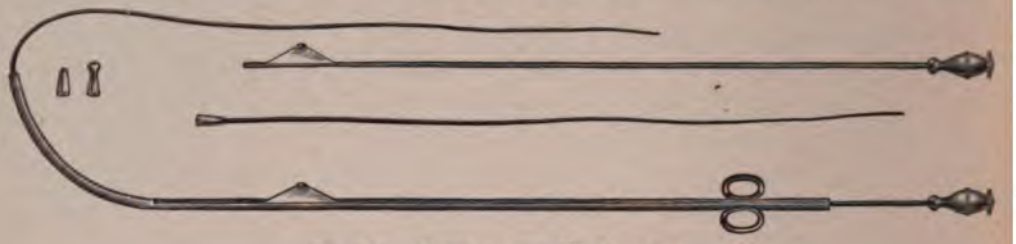


FIG. 747.—MAISONNEUVE URETHROTOME.

ated at the distal end of a thin metal carrier, while at the proximal end of the carrier is a small dilatation or handle. The apex of the triangular blade of the knife opposite the base or carrier portion of the triangle has a protecting dull shoulder, while from the apex to the base both in front and behind, the sloping blade is sharp.

*Technique of the Operation.*—The instrument is passed through the urethra into the bladder in the same manner as a sound. Often it catches at some point in the urethra and cannot be inserted farther. In such a case the filiform guide is passed through the urethra into the bladder and the metal urethrotome is screwed onto the guide and made to follow it. The guide meanwhile curls up in the bladder cavity. Fig. 748 shows the Maisonneuve urethrotome following its guide into the bladder. In either case, after the instrument has been introduced, it is held with its groove pointing to the space between the corpora cavernosa, and at right angles to the table, and its proximal end is grasped between the thumb and forefinger of the left hand of the surgeon. An assistant holds the organ at right angles to the body on the stretch, with his fingers on either side as is the case of the urethrotomy by the Otis instrument. The operator then takes the cutting portion of the Maisonneuve, holding it by the handle at the proximal part of the knife carrier, and inserts the knife into the groove. He then pushes the knife along the groove down the canal in such a way that the apex of the angle, which is dull, slides along the middle line of the

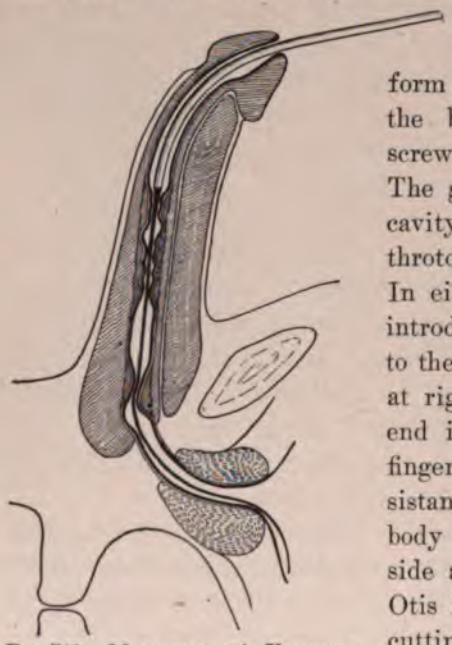


FIG. 748.—MAISONNEUVE'S URETHROTOME FOLLOWING ITS GUIDE INTO THE BLADDER.

roof of the urethra. When a stricture is reached, the knife stops, its cutting edge coming in contact with the stricture. A slight push severs the stricture and the knife passes through it to the healthy urethra beyond, along which it again glides without inflicting any injury on account of its dull guard on the apex, until it arrives at the next stricture, through which it passes in the same way (Fig. 749). The instrument is then withdrawn. It has cut the urethra up to 18 or 20 French. Further enlargement can be made by passing sounds or by introducing the Otis urethrotome and cutting the stricture to a still larger size. There are several knives of different sizes that go into the urethrotome, but it is advisable to use one that is as shallow as possible, as those that are too angular are liable to become bent by a resisting stricture and to tear the canal and the corpus spongiosum and the corpora cavernosa as well. It is also difficult to keep the blade of the knife sharp and the guard hinders the progress of the blade. The blade sometimes does not go through the stricture unless sufficient force is used, in which case there is danger of the formation of a traumatic stricture in the effort to cure an acquired one.

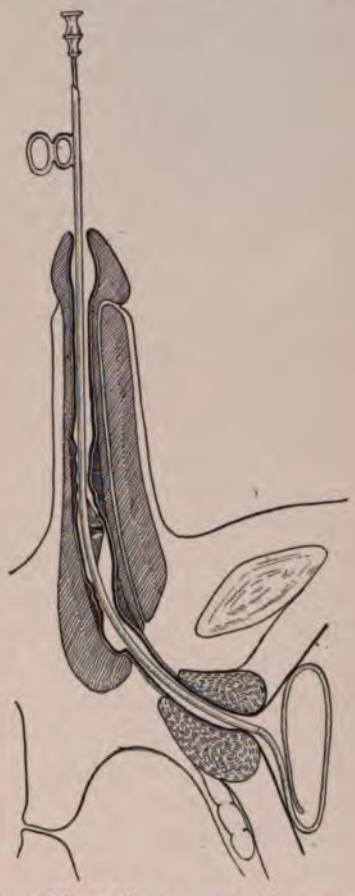


Fig. 749. — Maisonneuve Urethrotome in Place and Its Guide Curled up in the Bladder. The knife has passed through some strictures in the penile portion of the canal and is about to sever others near the bulb.

Therefore, although the instrument is most ingenious, I feel, for the reasons already enumerated, that it is not as accurate or as safe as the Otis urethrotome, and I consequently prefer the Otis in my operations. I find that I can employ the Otis in most cases that I have to operate upon, as my stricture operations are usually on patients in whom the marked narrowings are so deep in the perineal urethra, that I prefer to perform a perineal section first, cutting the deep strictures by this route, and then to use the urethrotomes for the stricture of the pendulous and scrotal portions.

The *treatment* after a Maisonneuve urethrotomy is the same as after the Otis operation. Hemorrhage sometimes occurs after an internal urethrotomy by either the Otis or the Maisonneuve instrument, and causes considerable alarm. It can usually be controlled by simply bandaging the organ. If this does not suffice, a catheter may be introduced and the organ again bandaged,

thus increasing the pressure on the cut surface. For fever, quinin grs. 10 or Dover's powder grs. 10 can be given. If a rise of temperature follows the passing of sounds, it is advisable to give a suppository of quinin grs. 10 and morphin gr. $\frac{1}{4}$ before passing them. It is also advisable, before passing a sound, to have the patient urinate and then to pass a metal catheter into the bladder and fill it with a boric-acid solution; after this the catheter is withdrawn and the patient voids part of the solution before passing the sounds and the remainder after their passage.

**External Urethrotomy.**—External urethrotomy is indicated in cases of stricture of the perineal urethra that are hard and unyielding to dilatation, whether traumatic or acquired; resilient strictures that dilate and then recontract; strictures complicated by perineal periurethral abscesses; strictures with extravasation of urine; strictures with perineal fistulas; strictures associated with attacks of retention of urine, and those that are accompanied by symptoms of cystitis that cannot be relieved.

Before going further, I will take up the point that is always confusing to the reader, which is the question of what constitutes a "guide." In performing an internal urethrotomy, there is the urethrotome and the guide. In this case, the guide is either the thin woven guide into which the Maisonneuve urethrotome is screwed, or the filiform bougie to which a Gouley sound or an Otis urethrotome is sometimes threaded. In both these cases, the guide is the small woven bougie or filiform which aids the entrance of the urethrotome. In external urethrotomy, on the other hand, any metal instrument with a groove on its convexity, along which the urethra is cut through the perineum, is a guide, whether it be a lithotomy guide, a urethral guide, or a Gouley tunneled sound or catheter. Some of these metallic guides have a small opening or tunnel at the end to enable them to slip over a filiform bougie, in which case there are two guides: The filiform, that is, the guide to the metallic instrument, and the metallic guide itself on which the stricture is cut. Strictures are very rarely cut on a filiform guide alone.

Preparation of the Patient.—The preparation of a patient for this operation depends upon the condition that exists. If a metallic guide can be passed through the urethra alone or with the aid of a filiform bougie, the ordinary preparation for any surgical condition is indicated. If a filiform cannot be passed, but the patient is able to urinate, it is well to put him to bed, have him take two hot sitz baths a day, keep his bowels open with saline laxatives and prescribe for him a mixture containing acetate of potash, grs. 15, and sweet spirits of niter ʒss three times a day between meals. A milk-and-Vichy diet is also indicated. Under such treatment, the congestion about the stricture, which usually is present in such cases, will diminish and a filiform can probably be passed.

If the patient cannot urinate, an effort is made to pass a small catheter, preferably a soft-rubber or woven one, through the canal, to relieve the retention. If successful, not over a pint of urine should be drawn off at first, and after this a pint is withdrawn every two or three hours until the retention is relieved. If a catheter does not pass, it is advisable to give the patient a quarter of a grain of morphin hypodermically and a hot sitz bath. The patient may pass some urine in the bath, and thus start the urinary flow; or else, on leaving the bath, it may be possible to pass a small catheter into the bladder. If he still cannot urinate and nothing can be passed, it is advisable to have him rest for an hour or so with hot applications to the perineum and pubic region; and then have him try to urinate, which he may be able to do; and if not, again endeavor to pass the instruments. If this fails, he should have one more hot bath, and if no urine is passed, he should then be aspirated suprapubically.

Upon *aspiration,* sixteen ounces of urine is withdrawn, and the patient is put to bed and allowed to remain there for a few hours, after which he should try to urinate, and, if unsuccessful, another attempt should be made to catheterize him, followed again by morphin and a hot bath. If this fails, aspiration can be repeated every six hours for half a dozen times or more, in case he is unable to either urinate or to be catheterized, withdrawing each time not over a pint of urine. After the urine has begun to flow or a catheter can be passed, the operation can be performed. Such persistent attacks of retention are rare and I have not been obliged to aspirate more than two or three times since I have been practicing urinary surgery.

In case a patient with retention cannot pass urine and it cannot be withdrawn by catheter after six or more aspirations, I believe that he should be operated by *perineal section,* notwithstanding the fact that patients suffering from retention have at times been aspirated over a hundred times. If a perineal section is performed in such a case, the bladder should not be entirely emptied at once, but after the perineal urethra has been opened and the perineal drainage tube inserted into the bladder, the tube should be plugged and a snug bandage put on the perineum. After this, the plug should be removed from the tube every two hours and ten or twelve ounces allowed to run out each time until the bladder is empty. It is a mistake to think that the bladder does not hold urine after a perineal section. Unless the sphincter muscle has been hacked, it usually holds perfectly and the urine drains through the perineal tube and not along its side.

The day before the operation, the patient should have a purge, preferably five grains of calomel, followed the next morning by three ounces of Carabaña water. He should be shaved both in the perineum and the suprapubic region and should be brought to the operating room with his bladder full of urine. He should not be allowed to pass urine for six hours before the operation. He

can have all the water he cares to drink, and urotropin up to four hours before the operation. It is much easier to operate on a patient with a full bladder than on a patient with an empty one, and it is the most important point to be attended to. In difficult cases in which I expect trouble, I often wind a piece of bandage about the penis before the patient is anesthetized to prevent his voiding during the anesthesia.

Instruments Used.—The instruments used for operations on the urethra are:

1. Bougies à boule.
2. Gouley tunneled sound and catheter.
3. Sounds.
4. Filiforms.
5. Maisonneuve urethrotome.
6. Otis urethrotome.
7. Knives, thin blades and probe pointed; scissors, straight, sharp and dull.
8. Thumb forceps; small gauze sponges (two inches).
9. Artery forceps.
10. Narrow sharp retractors.
11. Perineal grooved probe.
12. Perineal grooved director.
13. Perineal cannula.
14. Gorget.
15. Round curved needles.
16. Needle holder.
17. Plain catgut, No. 1.
18. Chromic catgut, No. 2.
19. Perineal catheter, No. 36.
20. Glass urethral syringe.
21. Glass bladder syringe.
22. Peroxid.
23. Salt solution.
24. Glycerin.
25. Sterile oil.
26. Hot boric-acid solution.

Preparation for Operation.—The patient is anesthetized with gas and ether, after which he is placed upon the table, lying at full length on his back or with the shoulders slightly elevated, with a small pillow under the neck. A tray table should be drawn over his knees, on which should be bougies à boule, Gouley tunneled sounds and catheters, filiform bougies, a urethral syringe, glycerin and oil.

Sometimes before operation it is difficult to determine whether a stricture

is organic or spasmodic. Under an anesthetic this is quickly determined. Many strictures that are impassable before a patient is anesthetized are passable afterwards. A number of times patients have been placed on my operation list as cases of impassable stricture and I have been able to pass sounds of large size after they have been anesthetized. Such spasmodic strictures,

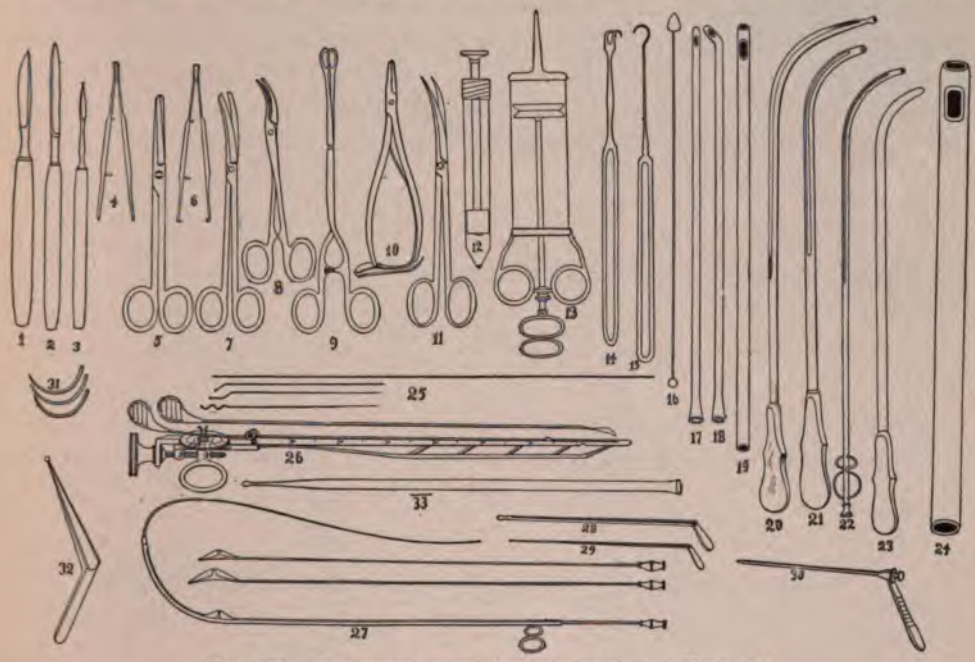


FIG. 750.—INSTRUMENTS FOR OPERATIONS ON THE URETHRA.

*1*, Scalpel.
*2*, Straight bistoury.
*3*, Gouley's beaked bistoury.
*4*, Thumb forceps.
*5*, Straight blunt-pointed scissors.
*6*, Mouse-tooth thumb forceps.
*7*, Curved blunt-pointed scissors.
*8*, Artery clamp.
*9*, Sponge forceps.
*10*, Needle holder.
*11*, Curved sharp-pointed scissors.
*12*, Small hand syringe.
*13*, Large hand syringe.
*14*, Two-pronged perineal retractors.
*15*, Tenaculum.
*16*, Bougie à boule.
*17*, Straight catheter.
*18*, Coudé catheter.
*19*, Straight catheter with opening at end and side.
*20*, Guiteras tunneled lithotomy guide.
*21*, Gouley's tunneled sound.
*22*, Gouley's tunneled catheter.
*23*, Metallic sound.
*24*, Perineal drainage tube.
*25*, Filiforms, straight, angular and spiral.
*26*, Otis urethrotome.
*27*, Maisonneuve urethrotome with knives of different sizes, one in the instrument.
*28*, Perineal probe-pointed grooved director.
*29*, Perineal grooved probe.
*30*, Guiteras perineal grooved cannula.
*31*, Round curved needles.
*32*, Gorget.
*33*, Olive-pointed woven silk bougie.

as I have said before, are due to inflammation or congestion of the posterior urethra or bladder which renders the tissues so tender that the contraction of the external or internal sphincters of the bladder takes place to prevent the instrument from entering the tender portion of the urinary tract. Such contractions take place in cases of tuberculosis or stone of the prostatic urethra

or bladder, and also in cases of congestion, acute inflammation or abscess of the prostate gland. The anesthesia removes the feeling of tenderness and consequently the spasm of the sphincter muscle does not occur.

Examination at the Time of Operation.—The operator stands on the left side of the patient, the assistant opposite him. He takes a bougie à boule and passes it into the urethra to determine what obstructions there are in the anterior portion, as here the strictures are located. These different narrowings are noted as the examination is being made.

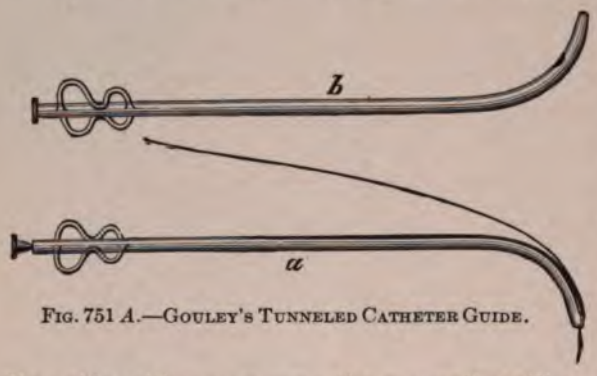


Fig. 751 *A*.—Gouley's Tunneled Catheter Guide.

(1) If a bougie à boule of No. 6 or 8 French passes to the bulb, i. e., a distance of six inches, the probabilities are that a Gouley tunneled sound or some other metallic guide with a groove on the convexity will reach there as well. It will then probably pass through the membranous urethra into the prostatic portion of the

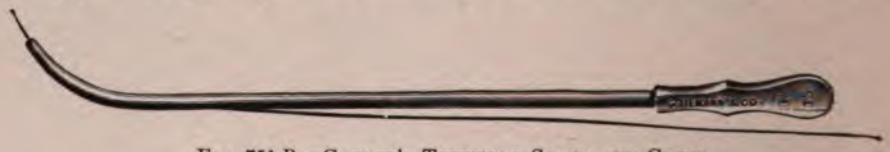


Fig. 751 *B*.—Gouley's Tunneled Sound and Guide.

canal, a distance of seven inches, and then into the bladder, in which case the perineal urethrotomy can be performed on the metallic guide.

(2) If the bougie à boule of the smallest size does not reach the bulb, and if a metallic guide of a similar size also does not, we must resort to the filiform. One filiform is first passed. If this passes through the strictures to the bulb and then through the membranous and prostatic portions of the canal into the bladder, a Gouley sound can probably be passed over this and the operation performed. If, however, the filiform does not pass the strictures, then a number of them are passed beside it, after which some manipulating of them is resorted to, to see if one will slip through the urethra, after the manner already described in the chapter on Examination.

If one or more filiforms cannot be passed when lubricated with glycerin, it is advisable to inject warm oil into the urethra with the urethral syringe, to hold it in the urethra and manipulate the canal well, so as to have it well lubricated, and then again perform the maneuvers just described. I never like to introduce oil into the canal, as it cannot be so well washed after the operation and I feel it predisposes to sepsis.

If a filiform passes through into the posterior urethra or bladder, then the smallest size Gouley tunneled sound or catheter that will easily pass over it is threaded to it and then passed along over it into the urethra in the manner already described, to see if it will also enter the posterior urethra or bladder. In case it passes in for eight inches or more, it is probably in the bladder and the proximal end of the instrument can be pushed down until it is parallel with the body. If it is a Gouley tunneled catheter and if its eye is in the bladder, urine will escape on withdrawing of the stilet. If it is a Gouley tunneled sound this can be moved from side to side, its point describing the arc of a circle. The perineal urethrotomy can be thus performed on a guide as in the first instance.

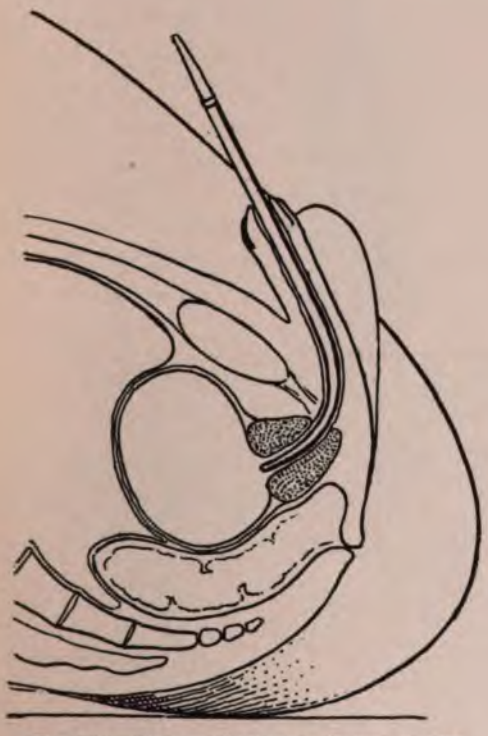


Fig. 752.—Gouley Tunneled Sound in the Bladder.

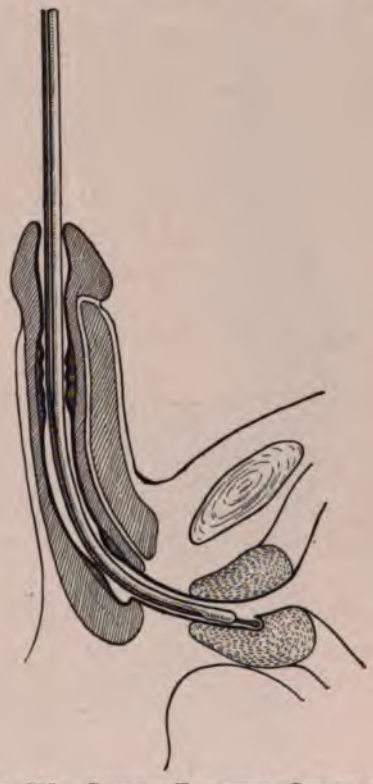


Fig. 753.—Gouley Tunneled Sound and Filiform Passed into Prostatic Urethra, but no Farther.

(3) If the end of the filiform only reaches the prostatic urethra seven inches or more and a Gouley tunneled guide passes over it for the same distance, then neither urine can escape from a tunneled catheter, nor can a tunneled sound, if used, be rotated in the arc of a circle as already described. In such a case, the perineal urethrotomy must be performed on the tunneled guide while its end is in the prostatic urethra (Fig. 753).

(4) If neither a tunneled sound nor tunneled catheter can be passed either alone or over a filiform into the prostatic urethra or into the bladder, then it should be passed down as far as possible until it is caught either in a stricture in the perineal urethra, in a pocket, or in a false passage in this portion of the canal. In any case, if the Gouley sound has not been passed into the prostatic urethra, every effort has been made to accomplish the purpose, and the operation must be performed on the guide in the perineal urethra, which has either caught in the bulb in a pocket or false passage (Fig. 754), or else in a perineal stricture in front of the bulb (Fig. 755).

Fig. 754.—Gouley Tunneled Sound Caught in the Bulb.

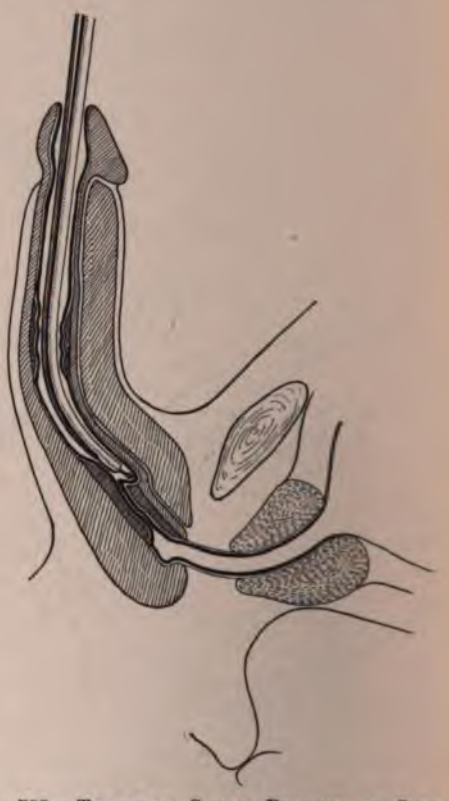


Fig. 755.—Tunneled Sound Passing to One Inch in Front of Urethra.

Position of the Patient, Operator and Assistants.—The patient is brought down into the lithotomy position with his buttocks on the edge of the table and his feet in the lithotomy uprights; or else his thighs are flexed and his knees are separated and held back against the abdomen by a Clover's clutch. The Gouley tunneled sound should be held in position by the operator while the patient is being brought into position, as he understands best the position in which he desires to have it held and is more careful to see that it is not dis-

placed by the sudden pulling of the body and the legs in fixing the patient in position for operation.

The operator then sits facing the patient's perineum; the table is made perfectly straight, as a perineal section (external urethrotomy) is an operation of precision, and any slight deviation of the table from a stright line in front of the operator may mean his cutting to one side or the other of the mid-perineal line and also of the urethra.

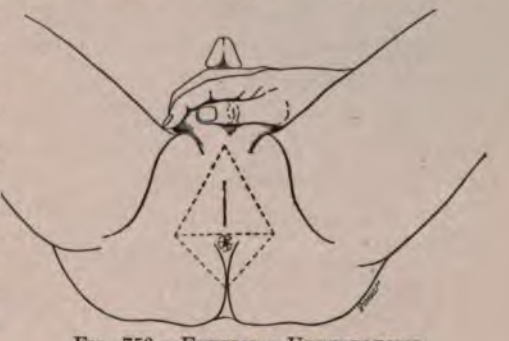


FIG. 756.—EXTERNAL URETHROTOMY. Perineal triangle with the incision.

The table tray is then pushed over the patient's chest, and another small table is placed on the operator's right within easy reach. On the tray table, he has the sounds and the bougies à boule placed on one side. He also has some artery and thumb forceps, catgut for ligating arteries and for traction sutures, scissors, thin round curved needle and needle holder. On the table at his right, he has a knife, two pairs of thumb forceps and artery forceps, the perineal grooved director, the grooved probe, the grooved cannula and the gorget, two small retractors with sharp curved teeth, a pair of bullet forceps, an Otis and Maisonneuve

FIG. 757.—EXTERNAL URETHROTOMY. Operator and assistants in position and the wound retracted.

urethrotome and a perineal tube. On either side of the patient an assistant stands; behind the first assistant is the nurse with the solutions and sponges. It is very important for the assistants to attend to the operation and not to look to the door or the nurse or to any other object, as it means turning the

body and interfering with the precision of the operation. The first assistant on the patient's left holds the metallic guide between his thumb and forefinger, his right forearm being over the patient's abdomen, the forefinger on the perineal side and the thumb toward the head. The other hand is used for sponging and assisting and should be under the patient's left leg. The second assistant passes any instrument required from the tray and the sponges, when the first assistant's hands are not free. His left hand is over the patient and right hand is passed under the patient's right leg so that it is near the wound. All is now ready for the operation which is considered by some as the most difficult one in surgery.

Technique of Operation.—*Perineal Section with Guide.*—The first assistant presses the metallic guide toward the perineum, taking care not to withdraw it. The operator raises the scrotum with his left hand and makes a vertical incision (Fig. 756) in the median line about two inches in length, cutting from just behind the scrotum to within three quarters or one half inch of the anus. He cuts down through the skin and fascia until he sees the bulb of the urethra. If there is any superficial bleeding, it is advisable to clamp the bleeding vessels and ligate them. The sides of the incision are retracted by an assistant on either side (Fig. 757). This shows the accelerator urinæ muscle about the bulb (Fig. 758). The operator frees the bulb, lifts it up toward the pubes with a sharp retractor, showing the tissues below the bulbous portion (Fig. 759). He then puts his forefinger behind the bulb and feels for the metallic guide. Having located it in

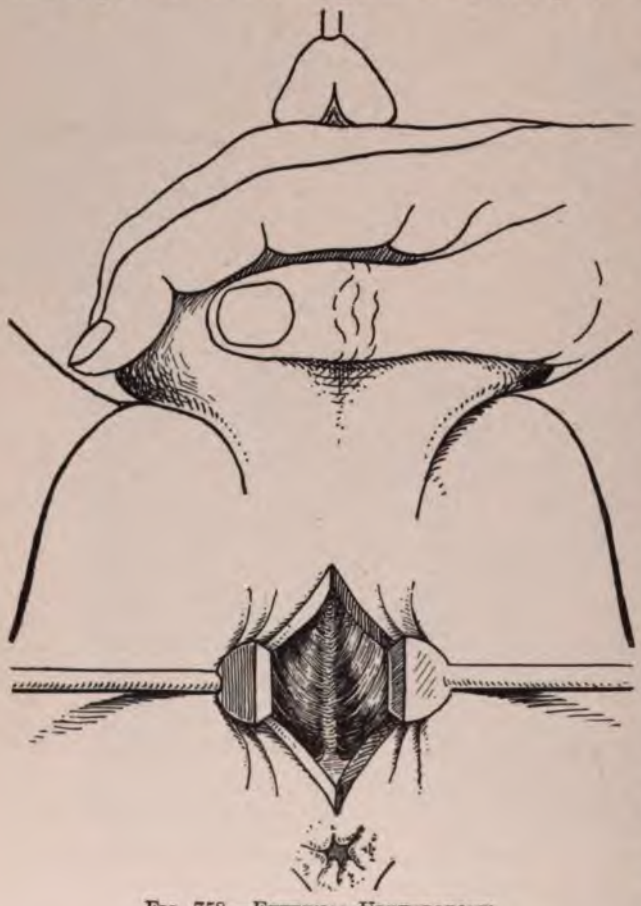


Fig. 758.—External Urethrotomy. Accelerator urinæ muscle about the bulb.

the median line, he then cuts just below the bulb down to the groove in the metallic guide. He feels the metal of the groove as the knife point comes in contact with it and the first assistant also feels it moving along the groove and pushing the guide (Fig. 760). The incision on the groove should at first be from above downward and not over half an inch long. The knife while still in the groove should be turned and held as nearly parallel to the groove as possible. It should then be pushed up along it anteriorly toward the meatus to cut any strictured portion that has not been severed by the cut down into the groove (Fig. 761). The incision in the perineum can now be plainly seen as well as the tunneled sound in the urethra (Fig. 762). It is frequently difficult to make a satisfactory incision when the assistant holds the guide as he rotates it somewhat, or the perineum is too thick or fat. The operator then takes hold of the handle end of the guide and cuts down upon the groove, steadying it himself. If he has any trouble in doing this, he inserts his finger into the incision again and locates the metallic guide before making another attempt.

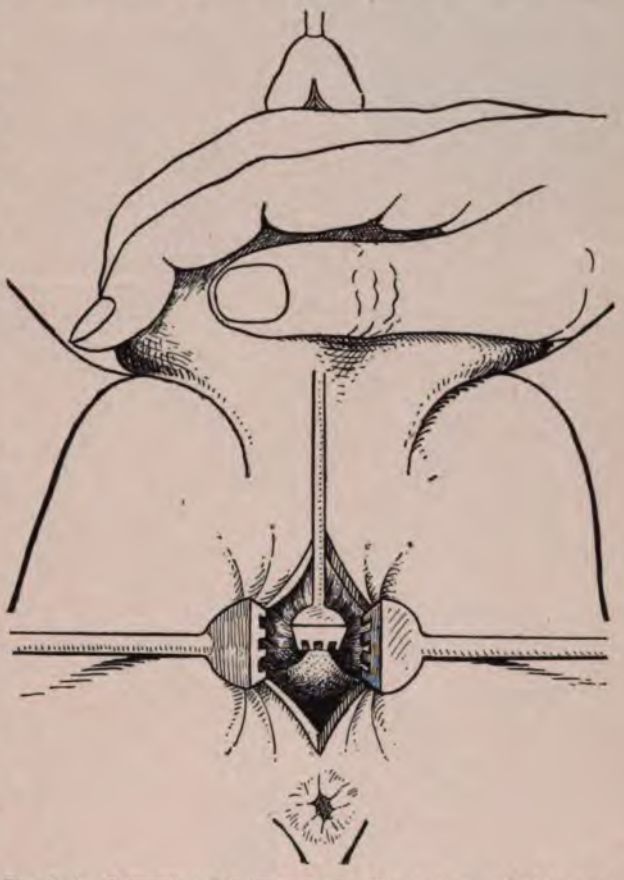


FIG. 759.—EXTERNAL URETHROTOMY. The bulb is raised by a retractor, showing the tissues behind it.

Here the technique varies. (1) If a tunneled sound has been passed into the bladder alone or over a filiform, the operator simply has to slide the blade of a knife along the groove, taking care to hold it as nearly as possible parallel with the instrument until it has entered the prostatic urethra (Fig. 763). A thin-bladed knife with a probe tip is excellent for such work. Having done this, he puts down his knife and takes the grooved perineal director, which he also slides along the groove of the metallic guide into the bladder. If this does not pass, he takes up the perineal grooved probe and slides it into the

bladder. After either one of these instruments has entered the bladder, he withdraws the metallic guide until its end is in the incision, in order to have more space to work on his perineal grooved director. He then slides the knife

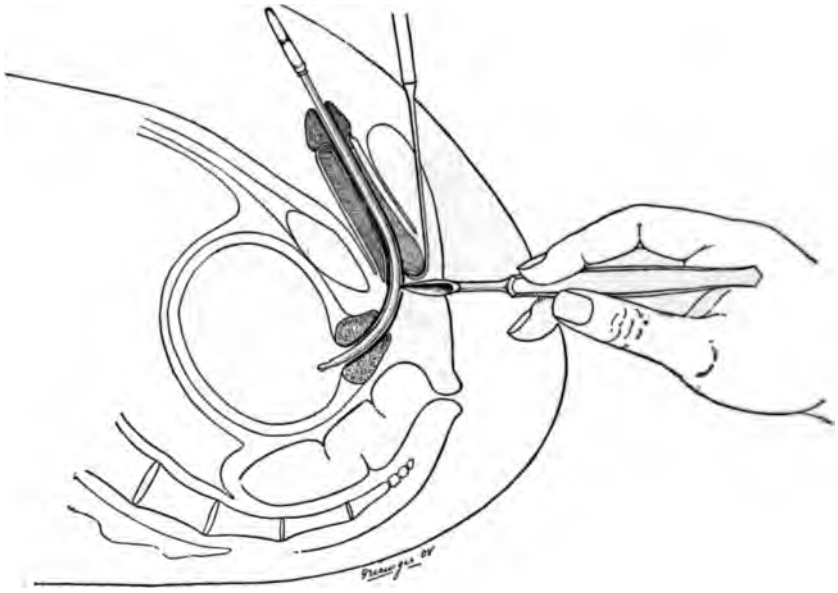


FIG. 760.—EXTERNAL URETHROTOMY. Sagittal section showing the incision being made down to the metallic guide. The bulb is seen to be raised.

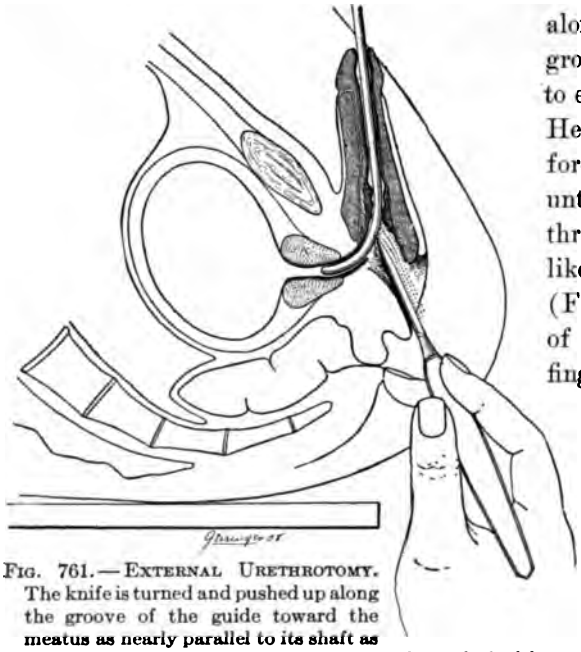


FIG. 761.—EXTERNAL URETHROTOMY. The knife is turned and pushed up along the groove of the guide toward the meatus as nearly parallel to its shaft as possible, in order to cut any stricture just above the incision.

along the grooved director, the groove pointing upward, in order to enlarge the incision (Fig. 764). He then inserts his little finger or forefinger along this instrument until it enters the prostatic urethra and passes through the ring-like sphincter into the bladder (Fig. 765). The feel of the neck of the bladder as it hugs the forefinger is something which, when once felt, will never be forgotten. It is usually soft and velvety and makes a mild uniform pressure, gently relaxing as the finger passes in. It also adds to the operator's peace of mind in complicated cases, as it shows him that the

principal difficulties have been overcome. If the deep stricture has not been cut through, as we are familiar with its extent, on account of the examination with bougies à boule, the tunneled sound is pushed down again so that its end is in the groove of the grooved director, and in this position, the knife can be pushed up toward the meatus from the perineal opening along the groove, severing the deep stricture, as has just been described.

(2) If the tunneled sound has been passed into the prostatic urethra alone or over a filiform, but not into the bladder, and the operation of cutting into the groove of the tunneled sound has been performed, a perineal grooved director or probe can be passed along it into the prostatic urethra and through into the bladder. This applies especially to the perineal probe which is very flexible and adapts itself easily to any turns in the posterior part of the canal. After the grooved probe or director has entered the bladder, the opera-

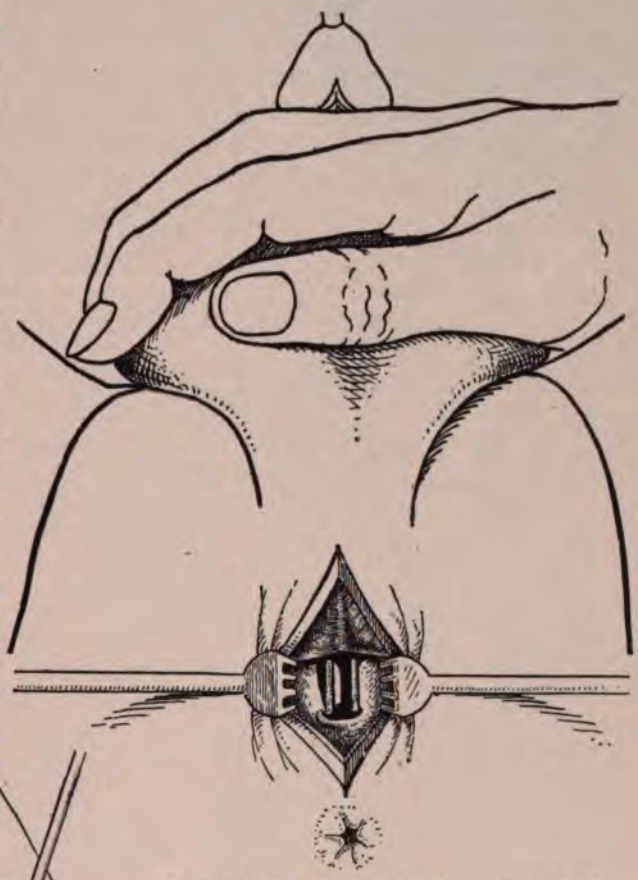


FIG. 762.—EXTERNAL URETHROTOMY. The incision can now be clearly seen, as well as the tunneled sound in the urethra.

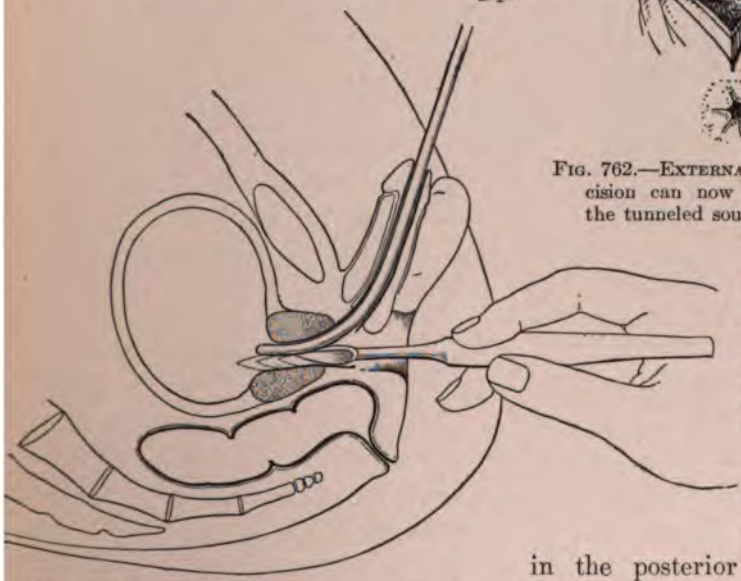


FIG. 763.—EXTERNAL URETHROTOMY. Passing of the knife along the groove of the Gouley tunneled sound into the bladder.

tion can be finished in the same way as if the metallic guide had entered the bladder.

(3) If the tunneled sound passes only as far as the bulb of the urethra and there catches while the filiform has passed through the membranous urethra into the prostatic portion or bladder, the tunneled sound having been cut down onto so that its groove can be felt, retractors are inserted on either side of the incision and the field of the operation widely exposed. The operator then sponges the operative field and grasps the urethral wall on both sides with the artery forceps, inserting a traction suture through them; or else he places sharp retractors in either side of the urethra which are held by the assistants. He then enlarges the incision until at least an inch of the metallic guide can be plainly seen and then proceeds in his attempt to pass through the stricture into the membranous and prostatic portions of the canal and into the bladder. If the incision has cut through the stricture, the tunneled sound will probably follow the filiform into the prostatic urethra and bladder. If it does not, however, then the filiform should be grasped below the end of the tunneled sound with a pair of forceps and held there, while the guide is withdrawn slightly. Then the filiform should be pulled out

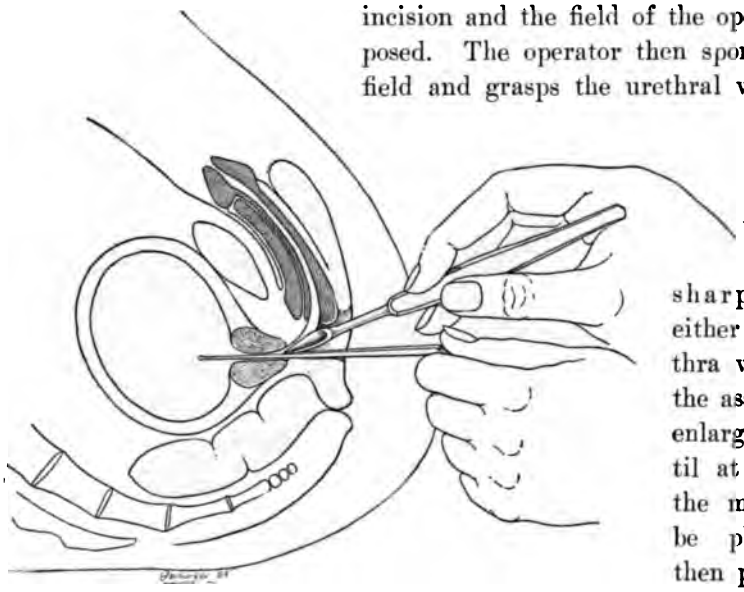


FIG. 764.—EXTERNAL URETHROTOMY. A small knife is passed along the grooved director to enlarge the incision.

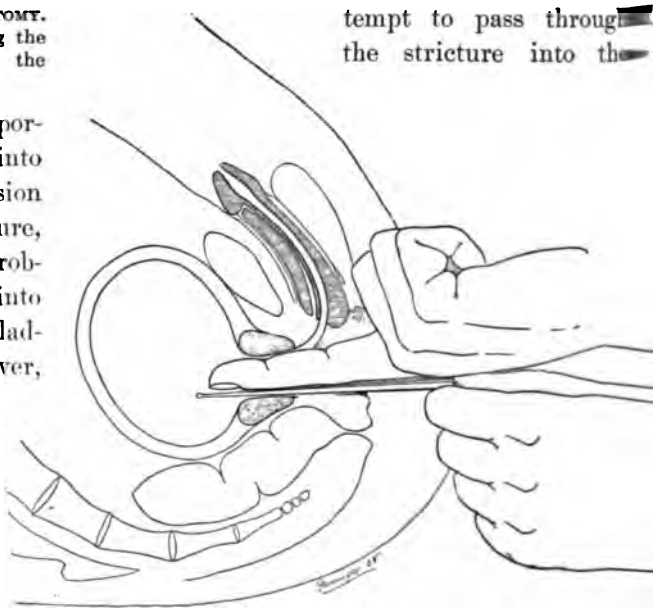


FIG. 765.—EXTERNAL URETHROTOMY. The forefinger is then [illegible] along the grooved perineal director into the bladder.

of the Gouley guide from below and held where it is, while the end of the Gouley guide is turned until its beak comes out of the perineal opening and faces the operator. The grooved probe should then be passed along the filiform into the bladder and the operation completed as already outlined.

(4) If the tunneled sound passes only as far as the bulb and if the filiform sticks in a pocket or false passage in the bulb and goes no farther, then the urethra should be opened as already described; the incision should be prolonged down to the end of the tunneled sound. The urethra should be grasped with forceps and traction sutures passed through both sides of the urethra and retractors inserted. The sound should then be turned so that its beak comes out of the opening, and the assistant on either side holds the urethra open by pulling on the traction sutures. The operator then sees in front of him the roof of the deep portion of the urethra, that is to say, the part just in front of the membranous portion. If there is bleeding, this should now be controlled. If any arteries are spurting or bleeding to excess, they should be ligated. If there is general oozing, a very hot sponge should be pushed into the opening and held there for a minute or two, when it will stop. The operator must now work with precision and not hastily, as too much haste interferes with his composure. He takes the grooved probe and feels for the opening into the membranous urethra. If he sees a number of openings, he should probe each one of these, and if they are too small to admit the probe, he should try the filiform. If not successful, he should cut down until he has come to the end of the bulbous portion of the anterior urethra, in case he has not already done so. In probing, he should hug the roof of the urethra (Fig. 766).

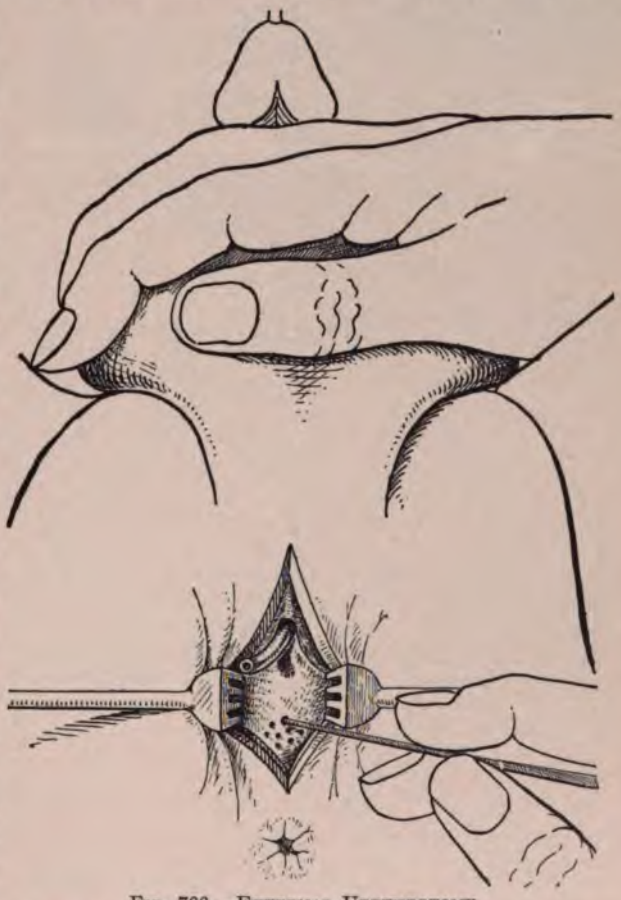


FIG. 766.—EXTERNAL URETHROTOMY.
Showing the process of probing for the opening of the stricture.

Very often he is probing into a pocket or false passage, whereas if he goes a little higher, he will find the true opening into the membranous urethra.

I have often sat watching this triangular space made by the traction suture on either side and the turned Gouley sound above, wondering how I would pass through without making a puncture, when some little move has revealed to me the opening. On some occasions I have seen four or five openings and have probed them all with the probe and filiforms without success and then, by pushing my probe down one side of the canal where no opening was apparent, I have easily gone through into the membranous urethra and bladder (Fig. 767). When the grooved probe passes through, a thin-bladed knife is passed along its groove, thus enlarging it, and then the grooved director is inserted and it is enlarged still more, after which the finger is inserted into the bladder. In case the probe does not enter but the filiform does, the probe can usually be passed along its side. I have had cases, however, in which the grooved probe did not pass but the filiform did. I have then taken a small tunneled sound and passed it over the filiform from the perineum opening into the bladder, then inserted my grooved director and completed the operation.

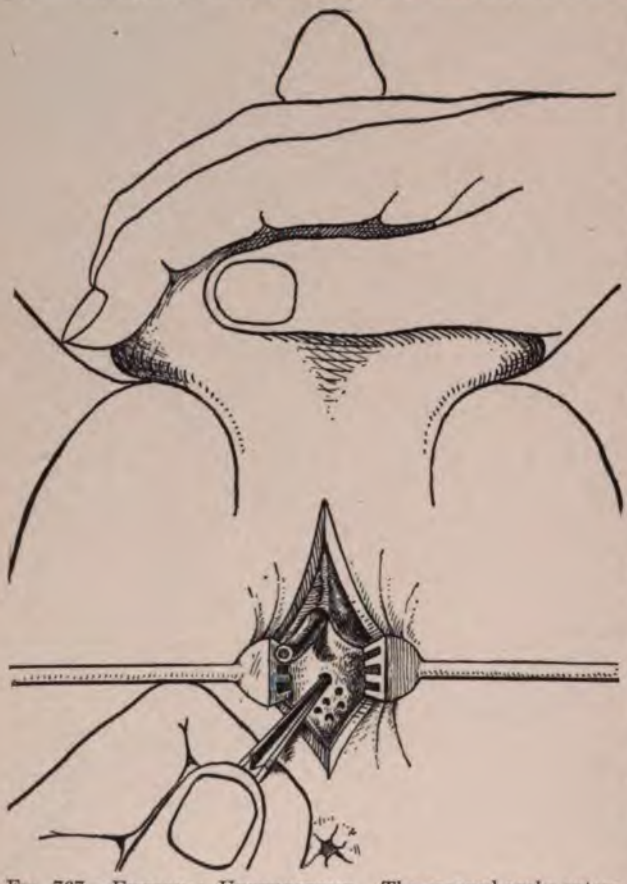


FIG. 767.—EXTERNAL URETHROTOMY. The grooved probe enters the stricture and passes through the membranous and prostatic urethra into the bladder.

It must always be remembered in distorted strictures of the deep urethra that reckless cutting may be followed by infection of the pelvic tissues about the bladder, or a septic phlebitis of the prostatic plexus or the plexus of Santorini, or cutting into the rectum. Whereas, if worse comes to worse, a suprapubic cystotomy can always be performed and a grooved guide passed down

from the bladder into the urethra and a direct incision made on it through the perineal opening (Fig. 768).

If the tunneled sound passes only as far as the perineal stricture some distance in front of the bulb, the method of operation depends somewhat on the distance to which the filiform has been introduced.

(5) If the filiform has been introduced into the bladder, the prostatic or bulbous portion of the canal, then, the tunneled sound having been introduced down as far as the stricture, the perineal incision should be made down to and into the groove in the sound, the walls of the urethra caught with traction sutures or retractors and retracted on either side, and the tunneled sound pulled forward until the filiform can be seen coming out of the tunnel. The strictured portion of the urethra should then be cut down in the mid-perineal line to the bulb along the filiform, or along a grooved probe passed beside the filiform, and the operation completed as in the last instance.

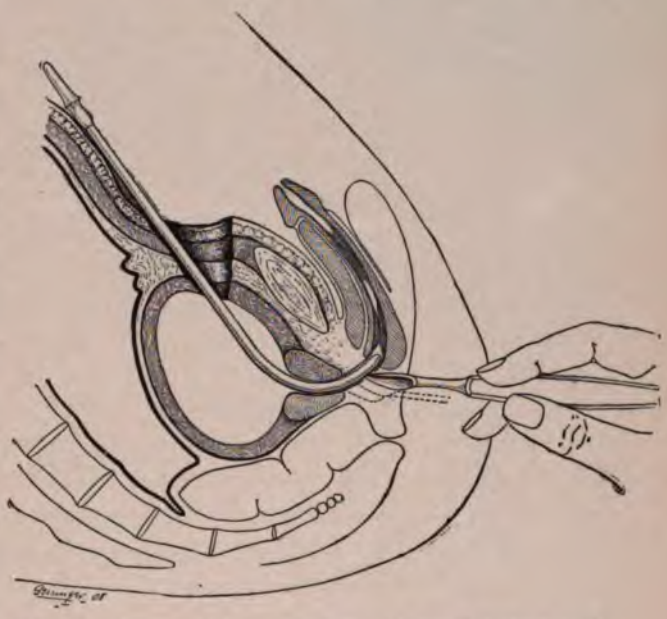


FIG. 768.—EXTERNAL URETHROTOMY. In case of a stricture of the deep urethra when a passage through the stricture cannot be effected, a suprapubic cystotomy can always be performed and a guide passed from the bladder into the perineal urethra and an incision made into its groove.

(6) If both the tunneled sound and the filiform stop at the stricture, the perineal incision down to the tunneled sound should be made, the urethra retracted on either side and the sound turned until its beak protrudes from the top of the incision. The cut having been made down to the stricture, attempts should be made to pass a filiform or probe through the narrowing. If either one passes, then the strictured portion of the canal should be split down to the bulb according to the description just given.

If nothing can be passed through the stricture, the perineal urethra should be carefully palpated and a vertical cut should be made down the mid-perineal line in an attempt to split the stricture at this point. This is nearly always successful and the bulbous urethra is reached behind the stricture. Sometimes, if the deep urethra is caught in the lowest part of the incision by a tenaculum, the operation is made easier.

After the bulb has been reached, an attempt should be made to pass a filiform or a grooved probe through the membranous urethra and the prostatic portion into the bladder. The further steps of the operation are similar to those previously described, depending on whether the filiform or grooved probe has reached the bladder, prostatic urethra or only the bulb.

(7) If the tunneled sound can be passed only into the scrotal urethra with or without the filiform, the incision into its groove should be made and, if the filiform goes farther, the urethra can be split along it, as already indicated; if the filiform goes no farther, the lower wall of the urethra should be split in the median line until the urethral lumen is again found beyond the stricture.

(8) If only a filiform can be passed into the scrotal urethra and the tunneled sound can be passed only two inches into the middle of the pendulous portion of the canal, an incision should be made down upon the filiform just below the arch of the pubes and, the urethra having been opened on the filiform, the strictured portion should be split down in the mid-perineal line to a wider portion of the canal beyond, as just described.

In either of these two cases, the split in the urethra should be continued down to the bulbous portion and the finger inserted into the bladder. In the second instance, when the filiform stricture still exists about two inches from the meatus, the filiform guide of a Maisonneuve urethrotome should now be passed through this stricture and out of the perineal or scrotal opening. It should then be screwed onto the Maisonneuve urethrotome, which in turn should be passed through the stricture of the urethra, after which the knife of the Maisonneuve should be pushed along its groove, cutting the stricture.

Sounds are then passed and the perineal drainage tube inserted into the bladder. The urethra can then be sewed with No. 1 or 2 plain catgut down to the perineal tube, and the deep layer of the superficial fascia and the skin also sewed down as far as the tube; or else the urethra need not be sewed at this point, but only the deep layer of the superficial fascia and the skin brought together. In either of these cases, the scrotal urethra will close. (In both instances, if preferred, the perineal urethra can be opened without a guide and an effort made to pass the filiform from the perineal urethra through the anterior urethra, as they sometimes pass more easily in this way.)

*Perineal Section without a Guide.*—When I began to do urethral surgery, if I could not have passed a filiform or probe from the perineal opening into the posterior urethra or bladder, instead of searching as carefully as I do now I would have inserted the forefinger of my left hand into the rectum to the apex of the prostate. I would then have pushed a knife held in my right hand through the perineal incision toward the internal meatus of the bladder until the finger of my left hand, acting as a guide, had felt the knife pass by the apex of the prostate in the central part of that gland. Then I would have cut slightly upward and so have reached the prostatic urethra, having gone through

the membranous portion of the canal (Fig. 769). This procedure, while it looks well, is one that I discarded fifteen years ago for a more conservative measure.

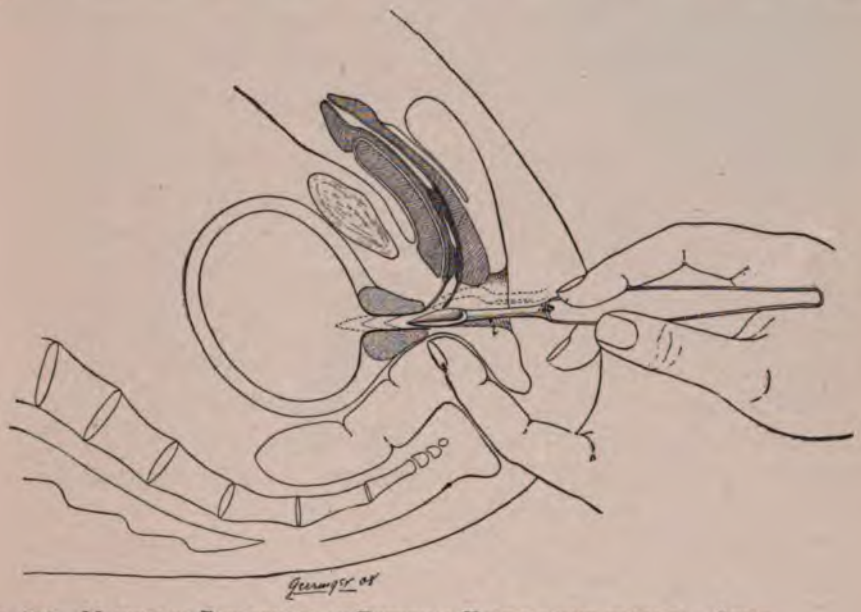


FIG. 769.—MANNER OF PERFORMING AN EXTERNAL URETHROTOMY WITHOUT A GUIDE.

*Perineal Urethrotomy by Means of Grooved Perineal Cannula.*—I then devised an instrument called "the grooved perineal cannula," which is very much smaller than the blade of a knife, which I could pass into the prostatic urethra and bladder in the same way and, by withdrawing the trocar, know when I was in the bladder through seeing the urine escape from the cannula. Since then I have not had to make any plunging operations with the knife, which operations were in my opinion exceedingly dangerous, unscientific and liable to be followed by sepsis. When I first invented this instrument I used it in a number of cases during the first two years. In the next three years I used it but once. During the last ten years I have not used it at all. I will describe a little more in detail the use of this particular instrument, which is one of great precision. The instrument, held by its handle in the right hand, should be passed through the perineal incision into the prostatic urethra, the finger of the left hand in the rectum on the apex of the prostate acting as a guide. If the trocar is then withdrawn, the cannula can be passed along the posterior portion of the canal into the bladder; but if, on withdrawing the trocar, it is

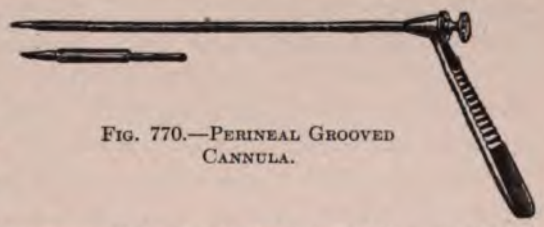


FIG. 770.—PERINEAL GROOVED CANNULA.

found not to be in the posterior urethra or bladder, the trocar can be again introduced and it can be pushed farther until it does enter the posterior urethra or bladder, from which point urine will escape. A narrow-bladed knife is then pushed along the groove of the cannula and then a grooved director, after which the right forefinger is passed into the bladder (Fig. 771).

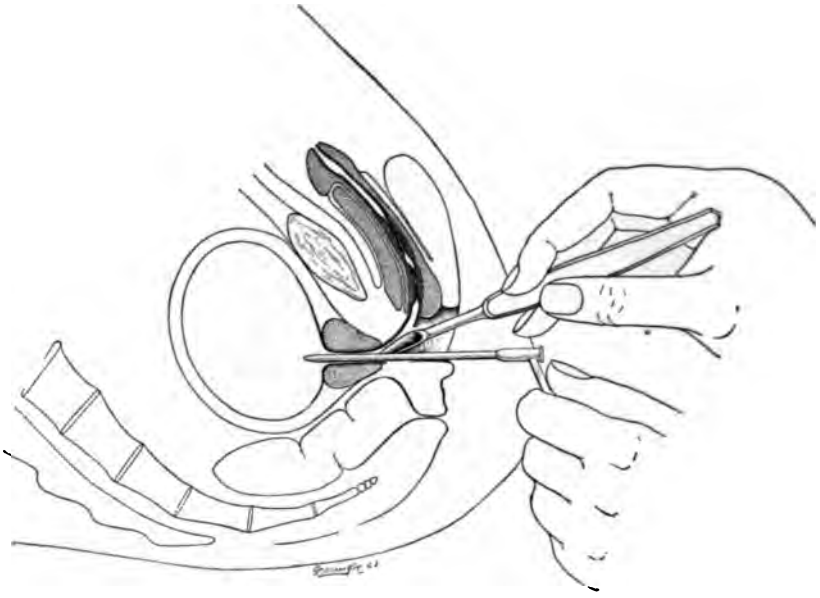


FIG. 771.—PERINEAL URETHROTOMY. Perineal grooved cannula passed through the perineum and the prostatic urethra into the bladder and a knife passing along its groove.

*Cysto-Urethrotomy.*—During the last ten years I have performed a very large number of perineal urethrotomies and have been able to go from the anterior to the posterior urethra without difficulty, except in two cases. In one of these cases there was a long, tortuous and thickened traumatic stricture of a year's duration, and in the other there had been a rupture of the urethra, due to a fracture of the pelvis, with a tortuous channel going through the ischio-rectal fossa and opening on the buttock. In both of these cases I performed a suprapubic cystotomy and passed a guide from the bladder down through the posterior urethra into the perineum, and opened it on the tip of the instrument from the perineal incision, thus obtaining a very fine canal.

Technique of the operation is as follows: First pass a filiform and metallic guide through the urethra as far as possible and then cut on to the guide and endeavor to pass through the stricture, or acquaint one's self with the operative field. Put the patient in the Trendelenburg position, perform a suprapubic incision down through the bladder wall, half an inch long. After this, lower the patient and put him in the lithotomy position. Put the left forefinger into the bladder, feel the internal meatus and with the right hand pass a groove

metallic guide through the prostatic urethra and bring its curved portion out in the perineum. Then make an incision through the perineum into the groove of the guide passed through from the bladder and connect this with the part of the urethra anterior to the stricture. We have thus seen how most of the difficulties connected with perineal strictures are overcome, and we will take up the consideration of the operative treatment, in both the front and back part of the anterior urethra.

When strictures are present both in the penile (pendulous and scrotal) and the perineal portions of the urethra, either an internal-external or an external-internal urethrotomy should be performed.

An **internal-external** or an **anterior-posterior urethrotomy** is an operation in which the strictures anterior to the perineum are cut before those in the perineum. The technique is as follows: First, localize the strictures and note their size and consistency. If the strictures are of small caliber, the Maisonneuve urethrotome should be passed with or without a guide, and the strictures cut by the method already described under Internal Urethrotomy.

If the strictures are of large size, over 15 French, the Otis urethrotome should be passed and the stricture cut. In either case, after the internal urethrotomy has been performed, a metallic grooved urethral guide is passed into the perineal urethra and a perineal urethrotomy performed on the guide, as already described under External Urethrotomy.

I formerly employed this procedure in many cases, but have now almost entirely given it up in strictures of small caliber, as in this class of strictures, the Maisonneuve urethrotome is used, and if they are old, hard and tortuous, considerable force is needed to push the knife with its dull shoulder through the narrowing. This may result in the bending of the blade and a cut to one side of the median line, or it may tear the strictured portion of the canal in addition to cutting it. Such traumatisms may result in hemorrhage or a septic urinary infiltration, although such a condition is less likely to occur when the internal urethrotomy is followed by external urethrotomy and perineal drainage. This does not apply to an Otis urethrotome.

As the perineal strictures are usually the tightest and most serious, I prefer to do them first and then have a freer space in which to do the internal urethrotomy. I think that my results have been better since I have been doing the external part of the operation first than they formerly were.

In the performance of the external-internal or the posterior-anterior operation, I attend to my perineal urethrotomy first and I then have a clear field in which to perform by internal urethrotomy. I may possibly return to the internal-external method, but do not think it probable.

**External-Internal Urethrotomy.**—First the external urethrotomy is performed by the method already indicated, in such a way that the finger can be passed through the perineal incision into the bladder. A grooved director is

then passed into the bladder through the perineal opening and the urethrotome introduced through the meatus and urethra until its tip lies in the groove of the grooved director. If the strictures in front of the perineal opening are of small caliber, the Maisonneuve is employed. When in place, the penis is held at a right angle to the body, as already described under Internal Urethrotomy, and the smallest blade of the Maisonneuve instrument is pushed down through the narrowings. If the strictures are of large caliber, the Otis urethrotome is passed down the urethra in the same way until it rests in the groove of the grooved director (Fig. 772). It is then drawn forward again so that its tip is just far enough behind the stricture, usually one inch, to have the knife sever it when it is pulled forward from its hiding place in the end of the urethrotome. If there are other strictures they should be cut in the same way.

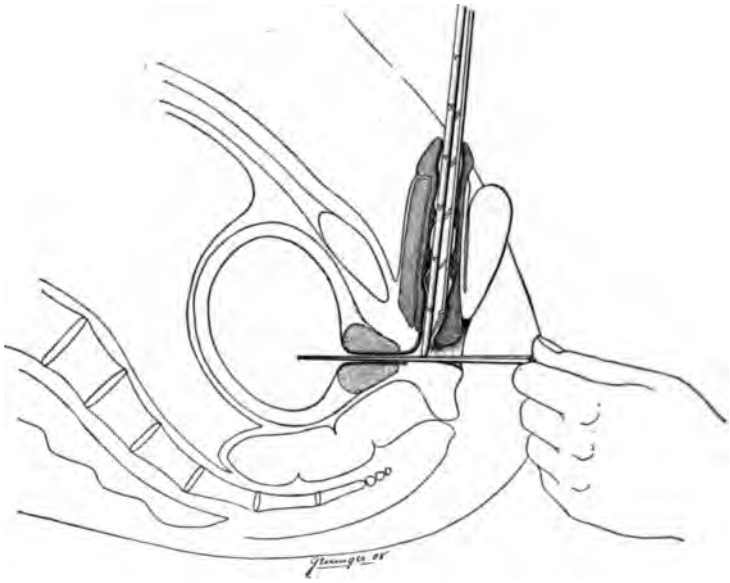


FIG. 772.—EXTERNAL-INTERNAL URETHROTOMY. Grooved director passed through the perineal incision and the end of the Otis resting in its groove. The knife is just about to pass through the stricture.

After the strictures have been cut by an internal urethrotomy, I remove the urethrotome and begin to pass the sounds. If strictures have been cut by a Maisonneuve urethrotome and do not admit a sound No. 30 or 32 French, but only No. 21 or 22 French, I make an examination with a bougie à boule and then pass the Otis urethrotome into the urethra and cut the stricture until the anterior canal is able to admit a No. 30 French.

I have performed a very large number of the combined external-internal urethrotomies and it rarely happens that I cannot use the Otis urethrotome. As I have said before, in my operative cases I find that most tight strictures are in the perineal portion of the urethra.

Before passing sounds, I introduce a gorget through the perineal incision into the bladder and then insert my finger along it to see that the passage is

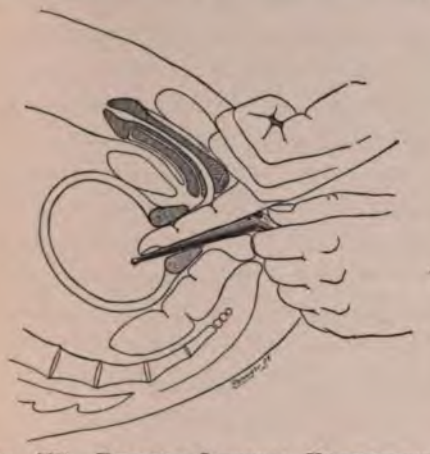


FIG. 773.—EXTERNAL-INTERNAL URETHROTOMY. Showing the gorget in place and the finger passed along it into the bladder.

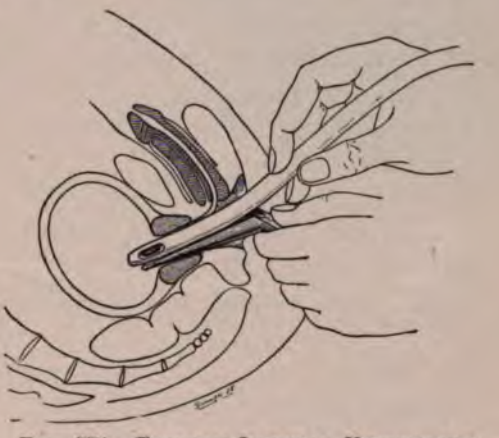


FIG. 774.—EXTERNAL-INTERNAL URETHROTOMY. The perineal tube is passed along the gorget into the bladder and any urine present escapes through the tube.

clear (Fig. 773). As the sounds pass through the urethra they strike the gorget in the perineal urethra and pass over it into the bladder. If the urethra is cut up to 32 French, it will generally retract to 30 French while healing. If it is cut to 30, it will usually retract to 28 French.

In cases of deep stricture I nearly always find that the meatus is narrow and perform a meatotomy.

After sounds of large size have been passed through the urethra into the bladder, the canal is flushed out with hot boric-acid solution. The perineal tube is passed along the gorget into the bladder and any urine present escapes through the tube (Fig. 774). The bladder is washed out with boric-acid solution and usually with a 1 : 2,000 solution of bichlorid as well (Fig. 775). The anterior urethra is washed out with peroxid of hydrogen, which is injected by means of a hand urethral syringe and is then washed again with boric solution. The perineal tube is drawn out until the eye is just within the bladder, as can be noted by filling the bladder with the solution, then pulling the tube down to a point where it no longer drains, then pushing it back until it

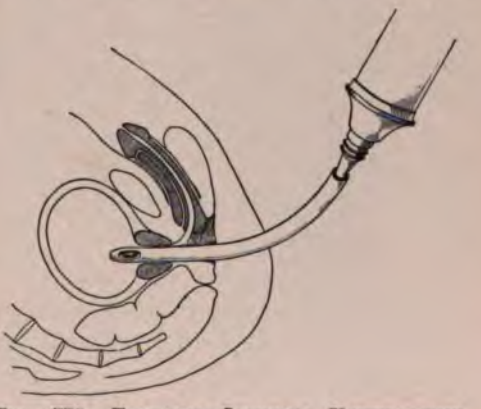


FIG. 775.—EXTERNAL-INTERNAL URETHROTOMY. The bladder is washed out with boric-acid solution followed by 1:2,000 bichlorid.

drains again, and fixing it at this place, as the best point of drainage. The perineal tube is best held in place by pinning it to the skin on the side of the incision with a safety pin. It is important to fasten the tube as indicated, for it can be seen that, if the tube is pushed in too far and then fastened, it will press against the wall of the bladder and cause some distress. The incision is then closed by three or four chromic sutures down to the tube (Fig. 776). A large pad of gauze, a combined dressing, is placed on either side of the perineal tube and the T-bandage is put on in such a way as to make pressure on the perineum, thus preventing a hemorrhage which might otherwise take place.

FIG. 776.—EXTERNAL-INTERNAL URETHROTOMY. The perineal wound is closed down to the tube. This is fastened to the skin by a safety pin.

**Accidents during the Operation.**—Accidents during the operation are rare. The most frequent one is HEMORRHAGE. This results from the operator not cutting in the place where the work should be done, which is principally just behind the bulb after this has been retracted up toward the scrotum. If the operator cuts through the bulb or cuts to one side of it, the hemorrhage may be quite profuse, as also if he cuts too far forward under the arch of the pubes and cuts the plexus of Santorini. Such hemorrhage is difficult to control and interferes with the operation by obscuring the operative field.

The treatment of bleeding at the time of operation is to catch and ligate any arteries that are spurting; whereas for general oozing, pressure with a piece of gauze soaked in very hot water is the best. Peroxid can be injected into this area, as can adrenalin (one part to ten or twenty of water) to stop the hemorrhage. Personally, I rarely have any hemorrhage to speak of during an operation, and generally do not have to tie any arteries, the pressure of the bandage being sufficient to prevent any hemorrhage following the operation. Sometimes in operating, if there is much oozing, I have one of the assistants play a fine stream of hot water on the perineum by means of a fountain syringe with but slight elevation and a medicine dropper at the end of the tubing.

CUTTING INTO THE RECTUM is another accident, rarely mentioned by operators, but which is liable to occur to anyone and has been experienced by many who have done a large number of external urethrotomies. I have had this accident happen but once when doing perineal section. Generally a puff of gas may be detected when this occurs. It usually takes place when there has been some inflammatory condition resulting in adhesions between the rectal and urethral planes just below the apex of the prostate. In this particular case I immedi-

ately cleansed the parts and passed a purse-string suture around the sides of the rent through the perineal opening. I then drew the purse string taut, tied and passed two more transverse sutures over this to invert it still more. The sutures were all No. 2 nine-day chromic gut. I then inserted a retained catheter and the recovery was uneventful. I should therefore suggest this method as an immediate operation for anyone having a similar experience. I did not pass sounds through the perineal urethra of this patient until ten days after the operation.

On one occasion I broke a needle while closing the perineal wound, the sharp end of which remained in the wound, as I could not find it. This operation was performed fifteen years ago and was not followed by any symptoms of distress and I have had the opportunity of keeping the patient under observation since that time.

**After-treatment of Perineal Section.**—After an external perineal urethrotomy has been completed and the patient has left the operating room with the perineal drainage tube in place, the treatment is as follows: The patient is put to bed and a glass tube is inserted into the end of the perineal drainage tube, with a piece of rubber tubing pushed over the other end of the glass tube, thus making a coupling of the glass tube. The free end of the rubber tubing

Fig. 777.—Perineal Tube in Place and Connected by a Glass Coupling with a Long Piece of Tubing Extending Over the Side of the Bed into a Bottle for Drainage.

extends over the side of the bed into a half-gallon glass bottle which is attached to the side of the bed. A certain amount of carbolic solution is put in the bottom of this bottle so that the end of the tubing will be beneath the fluid and the bladder will be drained by siphonage through the tube (Figs. 777 and 777 *A*). In the evening of the day of the operation, the glass tubing is removed from the perineal tube and the bladder is washed out with a saturated solution of boric acid.

On the first day after the operation, the bladder is again washed out twice through the perineal tube and the urethra as well, once with a saturated solution of boric acid and once with a 1 : 3,000 solution of silver nitrate. On the second day after the operation, the bladder is again washed out with boric acid, after which the tube is withdrawn and the urethra is also irrigated with boric-acid solution, which escapes by the perineal wound. The sounds are then passed. In passing sounds for the first time it is well to introduce a small gorget into the bladder through the perineum and then to pass the sounds down to and along the gorget, without using any force, beginning with a No. 20 French and increasing the sizes as long as they are well tolerated by the patient. The anterior urethra and the perineal wound are then washed out with 1 : 2,000 solution of nitrate of silver and the perineal tube is again introduced into the bladder and held in place for two days longer. At the end of this time it is again withdrawn and sounds passed. During this second interval of two days the bladder and the urethra are washed out in the same way as during the first two days after the operation.

FIG. 777 *A*.—PERINEAL DRAINAGE TUBE IN PLACE. The tube rests on a genito-urinary ring, or a bath towel, and is held in place on either side by pieces of tape.

When the perineal tube is withdrawn the second time, it is not reintroduced. The sounds are passed after this every two days until the wound closes, which usually takes place in between two and three weeks. After the tube has been withdrawn, each passage of the sound should be followed by the introduction of a metal catheter into the bladder by means of which the vesical cavity is filled with a solution of nitrate of silver (1 : 3,000) that the patient should then void. When the patient urinates, he should stand up, with his legs together, press a pad over the perineal opening and urinate into a glass duct.

Sometimes, through neglect to pass sounds after the operation, they cannot be made to enter without using undue force. In such cases, a perineal grooved director, or a gorget, should be introduced through the perineal wound into the bladder, and an Oberländer dilator should be passed through the urethra until its tip rests in the grooved director and it is at a right angle with the body.

It should then be held in this position and the anterior urethra stretched. Sometimes in these cases, the Kollmann dilator is passed through the entire urethra and opened until a satisfactory dilatation has been made, after which sounds can again be passed. The closing up of the urethra a few days after the operation is not a firm union and easily yields to dilatation. The perineal wound while healing should have a small piece of gauze introduced for a sufficient distance to prevent the outside of the wound from healing first, as it frequently happens that the perineum will heal and then break down again if this point is neglected. In one patient, I remember there was sufficient accumulation of urine in the perineum to form a small extravasation and the incision had to be opened again to allow better drainage.

Retained Catheter.—In certain patients with tortuous strictures, ruptured or deformed urethras, a catheter is passed through the canal at the time of operation and retained there for some days. In other cases, after the perineal tube has been removed, a retained catheter is passed through the urethra into the bladder and retained for a few days. This should be withdrawn every second day for the passage of sounds.

The bowels after the operation should be moved every day with a saline laxative: Apenta, Hunyadi, Carabaña water or citrate of magnesia. This should be followed three quarters of an hour afterwards by a breakfast of coffee, hot milk and toast. If one hour after the breakfast the bowels have not moved, a soapsuds enema should be given.

Temperature after the Operation.—On the night of the operation and on the following day there is generally a rise of temperature of a postoperative nature, depending in its severity upon the amount of pus in the bladder and the urethra. This temperature is usually 101° F. and may run from 99° to 101° F. or higher, until the tube is removed, which usually is on the fourth day. Patients with very tight strictures, chronic urethritis and bad cystitis sometimes run a temperature of from 101° to 105° F. for several days. Many patients have a chill and rise of temperature after passing sounds. This can usually be avoided by giving a suppository containing morphin, a quarter of a grain, and quinin ten grains, just before passing the sounds. Urotropin is given by me after a urethrotomy in nearly every case, thirty grains a day in divided doses. In case it is not well tolerated, salol grs. v four times a day or benzoic acid grs. xv is used. All my patients are given, besides this, three quarts of water a day. In some of my patients with very high fever I do not pass sounds so frequently. Irrigations of the bladder and urethra with nitrate-of-silver solution (1:4,000 to 1:2,000) through a catheter are very valuable in these cases of urethral fever. The perineal tube, when present, is sufficient in itself to cause a slight elevation of temperature.

Hemorrhage after Operation.—Hemorrhage after operation almost never occurs in my operative cases. Hemorrhage is generally due to exerting

too much force with the instruments or to having cut the plexus of Santorini or other important vessels during the operation. Such hemorrhages were seen more frequently in the old days, when perineal sections were performed without a guide and sounds of enormous size were used. The first case of urethrotomy, external and internal, that I had to take care of in the Charity Hospital in the days when Otis was advocating the cutting of strictures according to the dimension of the genital organ, was one in which I was instructed to pass a No. 40 French sound every other day. Bleeding in this case was so profuse that I had to use what is called a catheter *en chemise*. In the last twenty years of practice, I have never once had to use a catheter *en chemise*, which was so frequently used in those days. A catheter *en chemise* consists in tying a piece of gauze around a catheter (Fig. 778), introducing the instrument through the perineal opening into the bladder for a sufficient distance to have the chemise in the perineal opening, and then packing the space between the chemise and the catheter with absorbent cotton (Fig. 779) and putting a T-bandage on to keep it pressed in place. This is the best way of controlling a hemorrhage through the perineum.

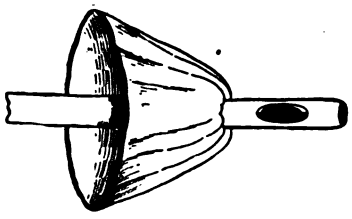


FIG. 778.—CATHETER EN CHEMISE.

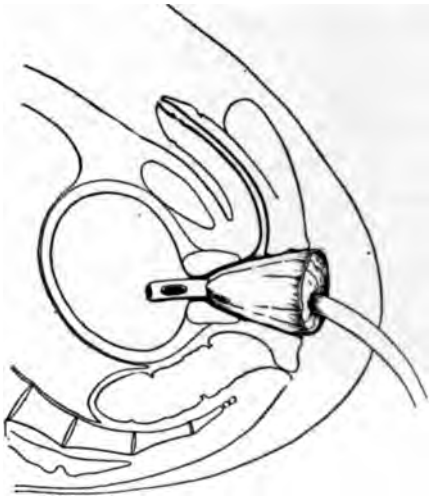


FIG. 779.—CATHETER EN CHEMISE PACKED.

The best way of controlling hemorrhage through the anterior urethra is b passing a catheter of large size through the canal and putting a bandage abou the organ in such a way as to make pressure of the urethra against the cathete Adrenalin can also be used for hemorrhage, while peroxid of hydrogen, a though not so powerful, is still very efficient.

**Treatment of Complications of External Urethrotomy.**—The patients o erated upon by external urethrotomy generally leave the hospital in from tw to three weeks. Patients have occasionally left healed in ten or twelve days When they leave at the end of three weeks they have generally been healed for a few days.

Slight SEPSIS and high continuous URETHRAL FEVER sometimes occur, bu usually subside quickly under antiseptic treatment internally and locally.

have had but few cases of prolonged sepsis, or sepsis coming on late after the operation, among the patients who remain in the hospital for three weeks. The results of my operation have been exceedingly satisfactory both to myself and to my patients. The mortality has been very slight. I estimate it as less than two per cent in external urethrotomies, whereas in internal urethrotomies, I cannot recall ever having lost a patient.

MILK LEG, as the result of phlebitis of the femoral vein, occurred in one of my cases, lasting for several weeks. The patient had suffered from severe hemorrhage after an external-internal urethrotomy, having returned home at the end of a week. He was treated at home for the relief of this hemorrhage which occurred after passing the sounds. He was then sent back to me, suffering from the phlebitis associated with considerable edema of the extremity on that side. It subsided uneventfully, however, upon symptomatic treatment.

Strictures associated with DISPLACED URETHRAS are rare. I have in mind two such cases, one in which the patient had the symptoms of a dense and impassable stricture, the other in which he passed all his urine through an opening in the scrotum. In the first case, I passed a Gouley sound as far as possible into the perineal urethra, made an incision down upon it in the median line and was then lost in the perineum. I used my perineal grooved cannula in the incision and entered the prostatic urethra and the bladder. I then inserted a grooved director in the bladder and enlarged the opening, after which I proceeded to make a dissection of the perineum, and found that I had cut into the side of the urethra, pushed the tunneled sound through the opening and made the second opening into the urethra on the perineal cannula an inch or more nearer the bladder. The urethra had been drawn to one side by a previous lateral lithotomy and closely hugged the ischio-pubic ramus on one side. I dissected the urethra away, brought it into place and split it in its long diameter from the point through which my Gouley sound had come out to the point into which my grooved perineal cannula had entered. Considerable hemorrhage accompanied this section. A retained catheter was passed through the entire urethra and the ordinary after-treatment given. The recovery was most satisfactory.

In the other case, I was able to pass a filiform through the urethra as far as the scrotal urethra. I then pushed a tunneled sound over it. On making my incision on this tunneled sound and retracting the perineal wound, I found that I was to one side of the urethra in a large space that contained considerable urine. This came out of the left side of the urethra just in front of the membranous portion, passed along the outside and to the left of the canal and escaped by a scrotal fistula. I opened the canal for over two inches and passed a retained catheter through it into the bladder; but a few days after the operation the patient developed a very high urethral fever and I was obliged to withdraw the catheter, reopen the perineal incision and drain the bladder

through a perineal tube. He could not tolerate the perineal tube and his fever went higher. I consequently withdrew the tube and began to pass sounds. Each passage was followed by a rise of temperature to 106° F. After trying all kinds of local and internal treatment without avail, I concluded that if I persisted in my endeavor to make a successful plastic operation, I would probably kill my patient. I gave up all treatment except internal urinary antiseptics and urethral irrigations of silver and boric-acid solution. He gradually recovered and left the hospital in the same condition in which he entered, that is, with a fistula in the scrotal part of the urethra complicating a stricture.

Periurethral Abscess.—External urethrotomy is often performed for a periurethral abscess in the perineum. I have had a large number of such cases. When I began to do perineal work in the male, I opened these abscesses and drained them without cutting through the urethra, and many of them resulted in fistulas. Since then I have also opened the urethra by a perineal urethrotomy in almost every case, and drained the patient by inserting a perineal tube into the bladder and putting a gauze drain beside it. In such cases, I do not sew up the wound close to the tube as previously described. Periurethral abscess will be discussed more fully in the chapter on this subject. Perineal fistulas are the result of periurethral abscesses and will be discussed later on.

## THE ELECTRICAL TREATMENT OF STRICTURE

Electricity has been used in the treatment of stricture by many advocates. It has been used in my clinic at the request of gentlemen connected with the school who have made high claims for its efficiency in the cure of stricture. These cases were not benefited by this treatment; in fact, they were made worse.

**Electrolytic Cure of Stricture.**—The only method that I have seen at all successful has been the electrolytic cure of Fort. I was very much prejudiced against this method, but I have had an opportunity of watching Fort's operation and of seeing results from ten to fifteen years afterwards. Fort's electrolytic instrument is shaped something like a Maisonneuve, except that the triangular knife is fixed in place, is dull and protrudes from the instrument near its end. A small woven guide the size of a filiform is first introduced into the urethra, the Fort instrument is connected with it and is then pushed along the canal until it encounters the stricture. Then the current is turned on and the electrolytic knife passes through the stricture; after which the current is turned off and the instrument is allowed to glide on until it reaches another stricture, through which it passes in the same manner. These strictures are severe and those of a small caliber are at once changed to narrowings of a fair size. After this operation, sounds are passed, as after a urethrotomy. I have seen these cases several years afterwards, and have been able to pass sounds of fair caliber and to stretch them without difficulty in case they had contracted somewhat.

## RESECTION AND EXCISION OF STRICTURES

(*Urethrectomy*)

This operation is performed particularly for dense, tortuous, traumatic strictures. In performing urethrectomy, the stricture can be either completely excised or a longitudinal portion of the canal can be left. It is advisable to leave a longitudinal band on the dorsum of the urethra whenever it is practicable, as it has a steadying influence on the tissues during the operation, besides rendering the union a firmer one than can be obtained by the approximation of separate fragments. This operation can be performed in any part of the urethra, but is most particularly employed in the perineal portion.

**Partial Urethrectomy.**—Partial urethrectomy might be called urethrorrhaphy and is, to my mind, the one of choice. The technique is as follows:

A metallic guide is passed through the strictured portion of the canal when possible. When this is not possible, a filiform should be passed and a tunneled sound should be introduced over it through the stricture; or if this cannot be accomplished, a tunneled sound should be passed down as far as the stricture. A perineal incision is made down to the urethra and the sides of the wound are retracted. An incision is then made down through the stricture into the gutter of the metallic guide, or else down on to the guide just above the stricture. Dense tissue, if present about the urethra, is dissected away and the urethra is caught by a tenaculum or forceps and its floor is opened longitudinally. The part of the urethra corresponding to the floor and the sides is then excised and a short longitudinal slit is made in the upper and lower segments in the median line of the urethral floor. Longitudinal sutures are passed to unite the gap in the side walls (Fig. 780). These are tied and then used as traction sutures on either side. Three more sutures are now passed, one in the median line of the floor from just above the upper, the longitudinal slit, to just below the corresponding lower slit, and two more, one on either side extending from the angle made by the longitudinal and transverse incisions in the

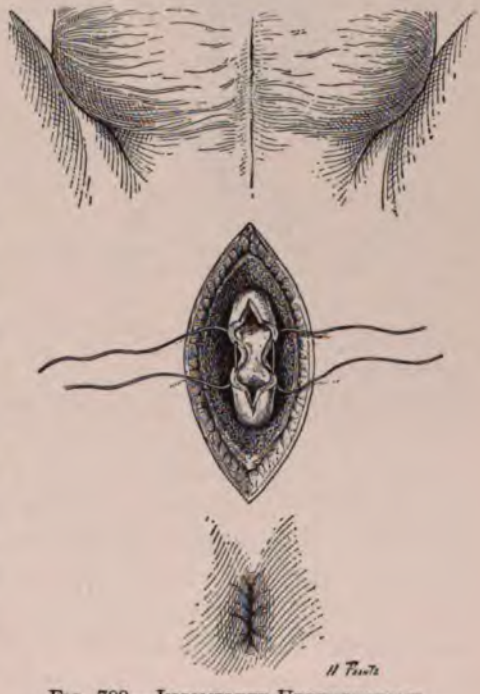


FIG. 780.—INCOMPLETE URETHRECTOMY. Showing the lateral sutures.

upper part of the wound to that made in the lower part (Fig. 781). When these are tied, the operation is completed and the seat of the stricture is wider than that part of the urethra when in its normal state before the stricture had formed. All the sutures used are of plain No. 1 chromic gut and pierce the outer walls of the gut only, not touching the mucous coat. After the operation, a soft-rubber catheter is passed into the bladder and retained. The perineum is united with interrupted sutures, except in the part just over the sutured portion of the urethra. The catheter is retained for a week unless there is much suppuration of the urethra, in which case it is withdrawn on the fourth or fifth day. While the catheter is retained in the urethra, the bladder is washed out twice a day with boric-acid solution. After its removal, sounds are passed every other day or else the urethra is dilated every second day by the Oberländer dilator. In case the perineal wound suppurates, the skin and deeper sutures should be removed and the wound irrigated and drained.

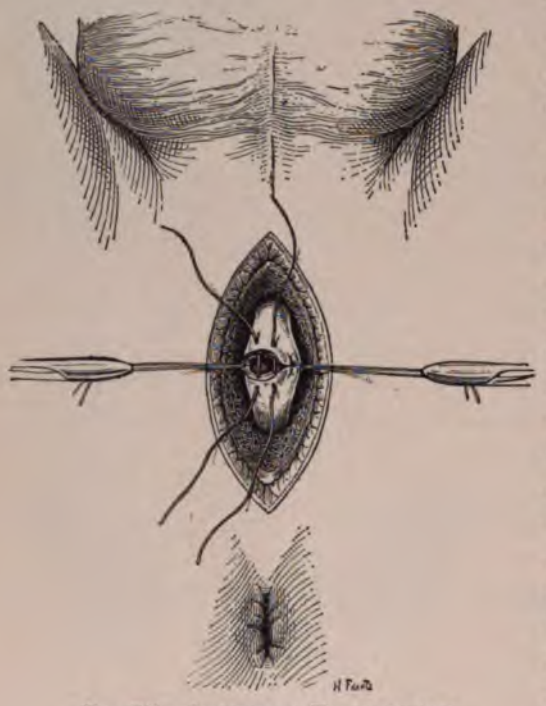


FIG. 781.—INCOMPLETE URETHRECTOMY. Showing the remaining sutures.

**Complete Excision of the Stricture.**—In this case the steps of the operation are the same down to the stricture. After the dense tissue has been dissected away from around the urethra and the field of operation freely exposed, the stricture is seized with forceps and excised by transverse incision above and below the strictured portion. The ends of the fragments are held with tenacula. A longitudinal incision is made in the median line of the floor of the urethra in the upper and lower segment. Two sutures are then passed through the roof of the urethra, traversing all its walls from within outward in its upper segment and from without inward in its lower segment (Fig. 782). These two sutures are then tied, the knots being on the inside of the urethra on its mucous wall. A lateral suture is now passed through the wall of the urethra on either side and tied. These are used as lateral traction sutures. The remaining sutures are the same as in the preceding operation. One suture is from just above the slit in the upper segment to just below the

slit in the lower segment, and the other two are on either side extending from the angle made by the longitudinal and transverse incisions above to the corresponding angle below. All these sutures, except the two on the upper segments, pass only through the outer walls of the urethra and not through the mucous coat.

The after-treatment is the same as in the preceding operation of partial urethrectomy.

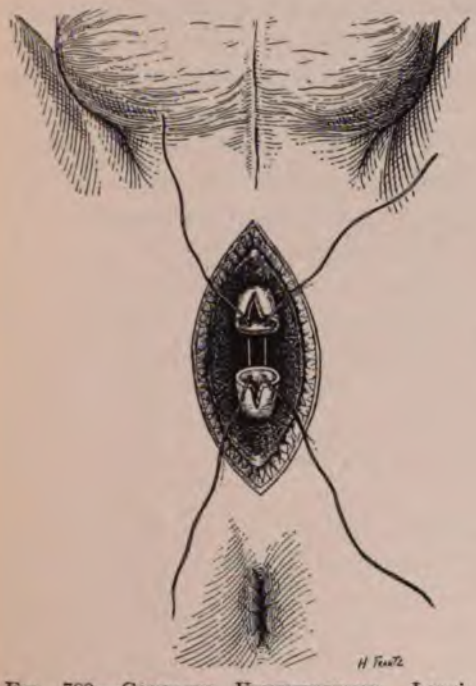


FIG. 782.—COMPLETE URETHRECTOMY. Longitudinal incision made in the median line of the floor of the urethra in the upper and lower segments and the posterior sutures uniting the fragments.

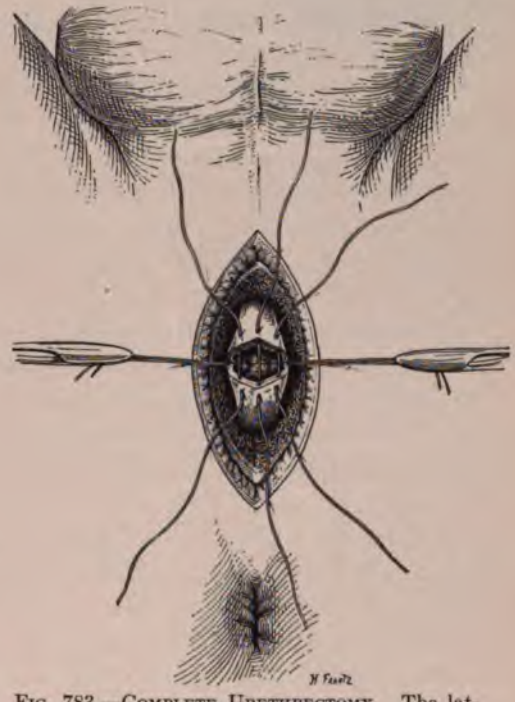


FIG. 783.—COMPLETE URETHRECTOMY The lateral sutures in place by which the urethra is stretched transversely and the three sutures in the floor of the urethra passed and ready to tie.

**Stricturectomy, the Stout Method.**—Dr. Stout, of Parkersburg, Va., has been removing strictures from the urethra by excision. He claims that strictures are the result of fibrous masses on the outside of the canal that press against the urethral wall and indent it, thus making projections into the canal that narrow its lumen, in the same way in which a pathological prostate may push the urethra in from the outside.

The Stout operation is briefly as follows: He makes an incision parallel with the long axis of the urethra in the median line. He cuts down to the stricture and shells it from the anterior urethra in the same way that a prostate is shelled from the posterior urethra in the line of cleavage. Dr. Stout, who is a skillful surgeon, has performed a number of these operations successfully.

A number of men who have seen him excise strictures have been very favorably impressed with the operation. He succeeds in removing them without opening into the urethral lumen or without any fistula resulting.

## REPAIR OF A RUPTURED URETHRA AT THE TIME OF THE TRAUMATISM

**Incomplete Rupture.**—In case the urethra is not completely ruptured, as can be determined by passing an instrument from the external meatus through the entire canal into the bladder, and there is but slight extravasation of urine and no sepsis, then a guide can be passed through the canal and the urethra can be cut down upon and sutured. In the case of an incomplete rupture when quite a severe extravasation is present but no sepsis, the perineum can be opened and the clots and urine evacuated and counterincisions made in the involved tissues through which the extravasated urine can be expressed. The pressure on the urethra having been removed, the guide can usually be slipped through the entire canal into the bladder and the same operation for the repair of the urethra can be attempted with the perineal tissues comparatively free from extravasation.

Technique of the Repair of an Incomplete Rupture of the Urethra.—The rupture is nearly always in the perineum and will be considered as such.

Place the patient in the lithotomy position, cut down through the perineum to the urethra, cleanse the periurethral tissues, retract the tissues thoroughly, find and examine the urethral wound. If it is a longitudinal wound in the floor of the urethra, nothing need be done and the patient would probably recover if sounds were passed every two days. For the sake of drainage, however, it would be advisable to enlarge the incision somewhat and pass a perineal tube through it into the bladder; or else not to interfere with the urethral wound and simply pass a catheter through the entire urethra into the bladder to be retained. The perineal wound should then be closed, with the exception of the part over the urethral tear which should be allowed to remain open for drainage.

In case it is a transverse wound, it is simply necessary to make a short longitudinal incision in the middle of the tear in the upper and lower segments and then to sew up the wound with longitudinal sutures in the same manner as in the operation for incomplete urethrectomy just described. In the case of necrosed tissue about the tear, it might be necessary to resect some of the urethral tissue, after which it should be closed in the same way as in a case of incomplete urethrectomy.

**Complete Rupture.**—Urethro-urethral End-to-end Anastomosis.—If, however, the urethra is completely ruptured, a guide cannot be passed through

the entire canal into the bladder, but only as far as the seat of rupture. The two ends of the urethral fragments should be sought for through the perineal incision and if found, they should be united by an end-to-end anastomosis. The bleeding, edema and extravasation of urine are usually such that the ends of the urethral fragments cannot be found at the site of the incision after the urine has been expressed from the tissues. In that case the wound can be left open and the patient allowed to pass urine through the perineum until the extravasation has subsided and the tissues have regained their normal thickness; or else a suprapubic cystotomy may be performed and a perineal urethrotomy made on a guide passed down from the bladder to the injured part of the canal, after which a perineal tube is passed through the perineum into the bladder for drainage until the tissues have been drained of all the extravasated fluid, when an attempt to make an end-to-end anastomosis can be made. The edges of the two segments should be cut transversely so as to afford good approximation, and they should be united in the same way as after complete urethrectomy.

I have never as yet seen a case of ruptured urethra which I considered a favorable one for urethral repair at the time or shortly after the accident. The method of repair indicated in some of these cases resembles so clearly that of urethrectomy that I thought it advisable to speak of it in this connection.

# CHAPTER LX

## PERIURETHRITIS

PERIURETHRITIS is an inflammation of the tissues surrounding the urethra. The urethra is composed of a continuous mucous membrane, supported by a submucous tissue connecting it with the various structures through which it passes, and forms part of the genito-urinary mucous membrane. The submucous tissue of the urethra is composed of a vascular erectile layer, outside of which is a layer of unstriped muscular fibers, arranged in a circular direction, that separates the mucous membrane and submucous tissue from the tissue of the corpus spongiosum.

There are follicles and glands emptying into the urethra. The former are simply small folds or pouches of mucous membrane and a few of large size, spoken of as crypts. The latter, the glands of Littré, situated in the mucous membrane, the submucous layer and even in the corpus spongiosum, are composed of true glandular tissue and their ducts empty into the canal through the mucous membrane. Cowper's glands, situated between the two layers of the triangular ligament in the same compartment as the membranous urethra, also empty into the bulbous portion of the canal. In the posterior part of the urethra, the glands of the prostate, usually called follicles, also secrete through their ducts into the urethra.

Inflammation of any of these glands or their ducts, together with their periglandular tissue, represent a periurethritis; although an inflammation of the prostate, follicular or parenchymatous prostatitis is considered in connection with the prostate rather than with the urethra. Cowper's glands are more closely associated with the bulbous portion of the urethra than with the membranous, as their ducts empty into it. An inflammation of Cowper's glands is spoken of as Cowperitis and is also considered independently. It accordingly leaves us for the consideration of true periurethritis only the inflammations starting in the penile portion of the urethra through involvement of the urethral glands, or through the spreading of the inflammation from the urethra, due to urinary leakage into the surrounding tissues.

**Etiology.**—The predisposing cause of periurethritis, or periurethral inflammation, is inflammation or stricture of the urethra or both; whereas the active cause is either an infection of the urethra or the urine. Besides this it may be due in some cases to an injury or an accidental cause.

(1) Periurethritis by Extension.—A periurethritis due to an inflammation of the urethra, extending to a gland of Littré along its duct, usually occurs during an acute gonococcal urethritis in the second week. It consists of small circumscribed swellings beside the urethra, usually situated near the frenum (Fig. 784), the midpenile (Fig. 785), the penoscrotal (Fig. 786) or perineal region (Fig. 787).

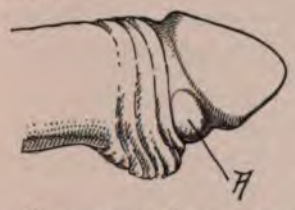


Fig. 784.—Periurethral Abscess in the Fossa of the Frenum—Parafrenitis.

Fig. 785.—A Periurethral Abscess in the Midpenile Region.

(2) Periurethritis Due to Obstruction.—Stricture is a predisposing cause of this variety of periurethritis. The urethra becomes dilated behind the narrowing, due to obstruction; the walls become thinned and urine stagnates there, in consequence of which the wall is liable to be torn by instrumentation or other causes,

Fig. 786.—Periurethral Abscess at the Penoscrotal Junction.

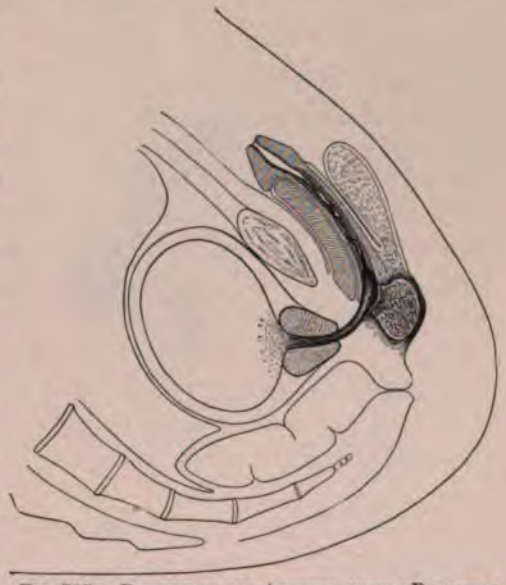


Fig. 787.—Periurethral Abscess in the Perineal Urethra Forming behind a Stricture.

thus allowing the urethral infection or infected urine to enter the tissues. Accidents, such as a fall or blow on the perineum, injuring the urethra, may also cause it. This occurs usually in the perineal part of the canal. The infec-

tion in these cases that gives rise to the inflammation, other than the gonococcus, is the colon bacillus, the streptococcus or the staphylococcus.

When slow leakage is present, the involved area is first inflamed and then usually walled off and an abscess results; but when the leakage is rapid, the condition is one of urinary extravasation with a very septic inflammation.

**Pathology.**—In the periurethritis due to extension, the nodule due to the inflamed urethral gland is about the size of a pea in the region of the frenum and would be found solid if cut through before suppuration has begun; whereas after an abscess has formed, we find a sac of pus with very thin walls. In other parts of the pendulous urethra, the inflamed nodule may be somewhat larger after an abscess formation, and the walls thicker. In the perineal urethra, the mass is usually larger and, after an abscess has formed, the walls are still thicker.

An abscess, forming in the perineum behind a stricture or in the region of a retained calculus (Fig. 788) when the urethra has begun to leak slowly through exertion or injury, often has a thick wall and reaches a fair size, even though it develops slowly.

In the case of a very slow leakage of urine from a point in the tissues of the deep urethra, a nodule may be present, varying from the size of a cherry to that of a door knob, of thick fibrous tissue, in which, on cross section, a small area of thick pus may be found near the urethra. Such a condition results from the leakage of urine through the mucous membrane in minute quantities, and slight infection comes later from the entrance of germs usually in the urethra (Fig. 702).

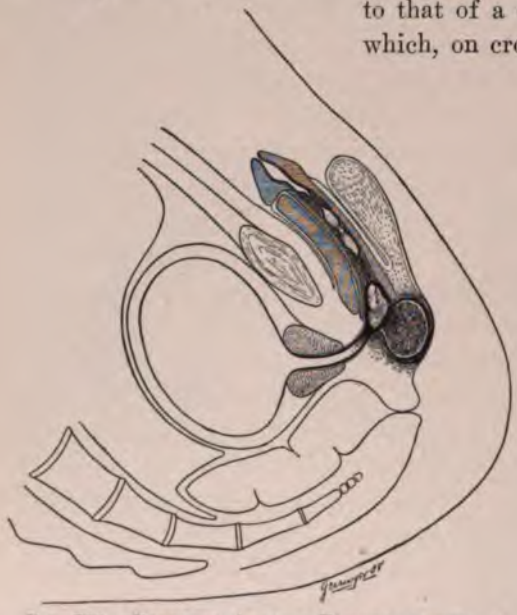


Fig. 788.—Perineal Abscess Forming behind a Urethral Calculus.

Chronic Periurethritis.—A nodule, cyst or chronic abscess forming in a urethral gland is usually hard, about the size of a pea, and may be situated at any portion of the canal. It is shut off from the canal by inflammatory adhesions, the walls are hard and the contents thick mucus and inspissated pus (Fig. 789).

Fig. 789.—Chronic Abscess or Cyst of a Urethral Gland.

Extravasation of Urine.—In these cases, the leakage of urine from the canal has been rapid and a large amount of infected urine is in the periurethral tissues. The cellular tissue beneath the two layers of the superficial fascia is full of urine and pus. If the case is fatal, the autopsy shows the perineum and sometimes the scrotum and the penis to be intensely congested and covered with black spots and blisters. On cutting through the deep layer of superficial fascia, a large amount of very offensive pus and urine escapes. This can be traced up to the hypogastric region and in the perineum to the point of leakage in the urethra. Gangrene and sloughs are often seen.

**Symptoms.**—We will first consider the varieties of involvement inflammation resulting from periurethritis. They are:

1. Acute inflammation of urethral gland beside frenum.
2. Inflammation of urethral gland in other parts of the pendulous urethra.
3. Inflammation of a urethral gland in perineal urethra.
4. A periurethral abscess due to *moderately slow* leakage of urine following the rupture of a urethral dilatation due to stricture or other causes.
5. A periurethral abscess following a *very slow* leakage of urine.
6. Chronic inflammation of a urethral gland in any part of the urethra.
7. Very rapid leakage through a break in the perineal urethra. urinary extravasation.

(1) Acute glandular inflammation of one of the glands of Littré situated near the frenum is the most frequent variety. This occurs usually during an acute attack of urethritis in the second or third week. A painful and tender area is felt by the side of the frenum, which rapidly develops into a nodule the size of a pea (Fig. 784). This nodule either disappears rapidly, undergoing resolution, or else it disappears suddenly, when it is at the height of its inflammation, through breaking into the urethra; also, while very tender and red, it suddenly becomes white at its apex and if not opened, bursts externally and discharges pus. After the abscess has broken, the lesion either heals or leaves a suppurating sinus leading into the urethra, or an opening externally. Occasionally it breaks both ways, leaving a narrow urinary fistula. Infection may remain in the sinus or fistula for a long time and, whenever a patient has a recurrence or relapse of urethritis, an abscess or discharge in the sinus will accompany it.

Frequently after the discharge of the urethritis has ceased, the discharge with or without gonococci will persist in the sinus or fistula. Sometimes after the disease has been cured for some time, the patient will contract an infection of the fistula, accompanied by a slight discharge from the fistulous tract, which will be followed later by a urethritis. I have known a urethritis to follow three weeks after the beginning of a discharge in the fistula. The periurethritis or the periurethral abscess may occur in one or both sides. The dis-

charge from the sinus or fistula usually ceases in time, even if not treated, and the sinus or fistula frequently closes without treatment. This subject was more thoroughly treated in an article entitled "Parafrenitis." (Guiteras, *Journal of Cutaneous and Genito-Urinary Diseases*, 1890.)

(2) Acute inflammations of the glands of Littré may take place in any part of the urethra. Quite frequently they are seen in the first third of the pendulous portion, about an inch behind the corona. They sometimes, but rarely, occur at the peno-scrotal portion. They are more frequent in the scrotal portion than at the peno-scrotal junction; in fact, two of the worst cases that I have ever seen existed at this point.

The perineal portion is the most frequent location next to the parafrenal.

(3) Periurethritis from an inflamed urethral gland in the perineum is frequently associated with a periglandular inflammation. It gives rise to a painful perineal tumor which usually develops into an abscess. It becomes red, fluctuates and breaks into the urethra or externally, and discharges pus often mixed with blood. It gives rise to difficult urination and sometimes retention of urine, unless opened.

Together with the local symptoms, there are those of general sepsis more or less marked, such as chills, sweating and an elevation of temperature.

(4) Periurethritis may also occur in cases of a dilatation of an inflamed urethra behind an obstruction, such as a stricture or urethral calculus. In these conditions, leakage of urine into the surrounding tissues can easily take place through sudden exertion, or an injury, especially in urethral instrumentation. In case the leakage is *moderately slow*, a urinary abscess results with symptoms similar to those before mentioned.

The importance of a careful history and a thorough examination in these cases was never more impressed upon me than some time ago, when a practitioner making a specialty of surgery, sent such a case to the hospital with the diagnosis of typhoid fever. He had at first treated him for malaria, as the patient had had a chill followed by fever and sweating; but when he found that the temperature was continuous, he concluded that it must be typhoid. The physician on the medical side of the hospital did not believe, from the history and general appearance of the patient, that he had typhoid and, on examining him carefully, found that he had a periurethral abscess in the perineum and transferred him to my service on the surgical side for operation. If this patient had had a blood examination made, malaria might have been excluded; the leucocyte count would have pointed to a suppurative process; the Widal reaction would have shown the absence of typhoid and a careful history and examination would have rendered the diagnosis easy.

Multiple abscesses may also form in this way. When they open through the perineum fistulas may result. If the leakage is rapid, there will be urinary extravasation.

(5) Periurethritis due to *very slow* leakage of urine gives us a very different picture, as in this form there are practically no symptoms of sepsis and a tumor forms in the perineum, which is walled off so slowly that it shows itself as an enlargement of stony hardness, varying in size from a cherry to a door knob. I have seen such growths in the perineum larger than a golf ball interfering with urination. There was no evidence of abscess present, however, and on performing a perineal urethrotomy and cutting through such a tumor, a creaking sound was heard, due to the denseness of the tissues. The tumor was practically all wall, with a small cavity near the urethra about the size of a cherry stone, containing a small amount of gray gelatinous pus. Under perineal bladder drainage, the thick wall quickly underwent resolution.

(6) Chronic periurethritis, variously called chronic follicular abscess, cyst of the urethra and by other names, is, as has already been mentioned, a chronic inflammation of one of the glands of Littré, in which the duct has been occluded by the inflammation and mucus and other matter having collected in it. These abscesses are usually indolent from the beginning. They give rise to no pain. Later on they may either be absorbed, or gradually soften and break into the urethra or externally. When they break into the urethra, the urine entering the cavity in passing may later leak out into the urethra and give rise to a slight dribbling. They can be felt as small beads in the urethral wall.

(7) Extravasation of urine is due to a break in the urethra of such an extent that a large amount of urine leaks so quickly into the tissues that there is no time for the limiting wall of fibrinous exudate to form. This may be due to the rupture into the urethra of an acute or chronic follicular abscess, leaving a cavity into which urine may extravasate; to an ulceration in a dilatation behind a stricture, or such a thinning of the mucous membrane that the urine suddenly breaks through into the surrounding tissue by its own force; or to a fall or blow on the perineum or any of the injuries mentioned in the chapter on The Injuries of the Urethra.

**Treatment.**—The treatment of periurethritis is simple. When a painful swelling occurs, put on a wet dressing of lot. plumbi et opii, a one-per-cent solution of carbolic, or a 1 : 10,000 solution of bichlorid. If the condition becomes worse and a suppurative process is threatening, apply poultices.

When fluctuation is present in any case of periurethral abscess, the abscess should be opened.

In case the abscess is perineal, an external perineal urethrotomy should be made and the abscess drained through the incision. In case there are symptoms of pressure on the urethra, giving rise to difficult urination and retention, a perineal urethrotomy should also be performed and the bladder drained.

Whenever there is the slightest indication of urinary extravasation along any part of the urethra, a perineal urethrotomy should be immediately per-

formed and the urine drained away through a perineal tube retained in the bladder.

A periurethritis about the membranous portion of the canal rarely results from an extension of the inflammation from the membranous portion of the urethra, but usually because it has extended from the bulbous portion of the urethra to Cowper's glands. When a Cowperitis has developed into an abscess, the suppuration may extend to the ischio-rectal fossa, the perineum or the pelvis, by extension through the fascia in the same way that extravasation of urine may result from extension through ruptured fascia after an injury to the urethra.

We may also have an abscess that develops from an acute prostatitis following an acute posterior urethritis. This may in turn result in a periprostatitis which involves either the tissues of the external capsule or the prostate, the ischio-rectal fossa, the cellular tissue in front of the rectum, the cellular tissue of the pelvis, or else it may break and discharge into the rectum.

# CHAPTER LXI

## FISTULAS OF THE URETHRA

s chapter we will consider the acquired fistulas and not those of the variety. In men, these fistulas are situated (1) in the pendulous, scrotal, (3) in the deep (perineo-bulbous) portion and (4) between a and the rectum (urethro-rectal). In women, they are (5) be- urethra and the vagina.

**. Fistulas of the Pendulous, Scrotal and Perineo-bulbous Portions thra.**—ETIOLOGY.—Fistulas of the pendulous portion of the urethra stricture, narrow meatus, urethral calculi, periurethral abscess, in- m external or internal causes giving rise to abscess or extravasa- ine, and injuries from internal urethrotomy. These fistulas are occa- ut rarely due to tuberculosis, syphilis and cancer. Most of the cases of the pendulous portion are due to suppuration of the urethral

LOGY.—(1) *Pendulous Urethra.*—In a case following an abscess sa by the frenum, the most common type, the fistulous opening is in size, usually situated by the side of the frenum and is short ght. It is generally surrounded by cicatricial l usually behind a stricture of the meatus or a of the canal in front of the fossa navicularis. end of the fistula is generally very small and

nost every part of the pendulous portion of the fistula is situated behind a stricture or an involved gland. The openings, however, are usually larger irregular than in the cases situated near the frenum ).

FIG. 790.—OPENING OF A FISTULA IN THE PENDULOUS PORTION OF THE URETHRA.

the *scrotal* portion of the urethra the fistula is also erally behind a narrowing of the canal. The outer larger and more indurated than in the pendulous d the fistulous tract is longer.

n the *perineal* portion of the urethra, the urethral opening of the usually behind a stricture or some other obstruction. There is

generally but one external opening present (Fig. 791), but, with recurrent abscesses and retained pus, there may be many. The fistulous tracts average two inches in length. They are tortuous and have dilatations holding urine and pus. In multiple abscesses, the source of this fistula may be situated in different planes in the perineum (Fig. 792). Sometimes the proximal end is situated above the triangular ligament near the prostate and often communicates with it. The walls of these fistulas differ greatly. Some are simple and but slightly thickened; whereas others are irregular with sclerous thickenings along the tract, giving the external appearance of an elephantiastic condition by having a lardaceous look, with diffuse or scattered bulgings.

Fig. 791.—A Perineum that has been Operated upon for Fistula Several Times and one Opening that Still Exists.

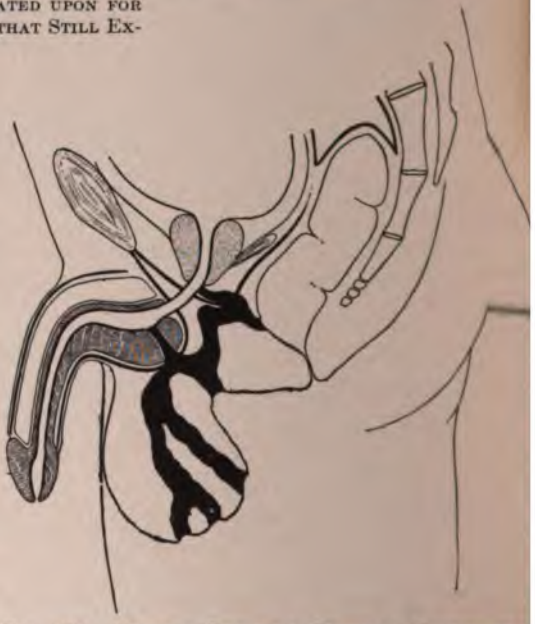


Fig. 792.—Several Perineal Fistulas Connected with the Bulbous and Prostatic Urethra and Emptying through the Scrotum, the Perineum and into the Rectum.

Symptoms.—The urine generally rushes into the fistulous tract, and in the pendulous portion of the canal quickly escapes in drops or jets. In the perineal portion it does not always escape as rapidly and sometimes only drop by drop, while at other times not until after the act of micturition. Occasionally, no urine passes through the fistula for several days, and the patient thinks that he is cured, but it always returns when the inflammatory condition has subsided, or any accumulated discharge has been washed out. There is frequently a smarting and painful sensation in the sinuses during micturition.

EXAMINATION.—Inject methylene blue into the urethra or bladder through the meatus and it will come out of the fistula. Pressing the perineum causes pus and urine to escape from the fistulous tract. The thickenings and openings are seen in the perineum. If a sound is inserted into the urethra, a thin probe passed into the fistula will show the direction and character of the walls of the tract, the presence or absence of stone and the location of the urethral opening. The discharge from the fistula is found to contain urine.

TREATMENT.—This consists in treating the cause, changing the course of the urine and obliterating the fistulous tract. If a stricture is present in front of the fistula, it should be dilated if dilatable. If it does not dilate readily to the normal size of the urethra, it should be cut by an internal or external urethrotomy.

(1) *Pendulous Urethra.—Plastic Operations.*—Fistulas of this part of the urethra, as we have already seen, have almost no tract, as the mucous membrane of the canal is in close connection with the skin. The operations comprise urethrorrhaphy and urethroplasty.

(a) URETHRORRHAPHY.—A sound or catheter is passed through the urethra and two elliptical incisions are made about the fistula with a converging slant

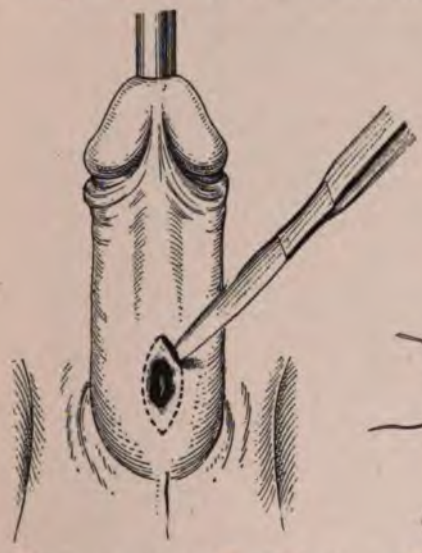


FIG. 793.—URETHRORRHAPHY. The fistula is excised by elliptical incisions made about it inclining toward the urethra.

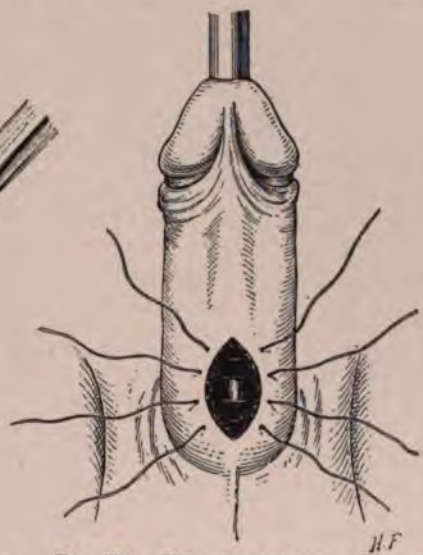


FIG. 794.—URETHRORRHAPHY. The sutures are passed down through the skin and other tissue as far as the urethra and tied.

toward the urethra. This incision is made with a small knife having a short blade (Fig. 793). After the piece of tissue including the united skin and mucous membrane of the border of the fistula has been removed, four transverse sutures piercing the skin and all the tissues down to the urethra are passed. The two middle sutures pass over the opening in the urethra, whereas

the other two pass through the tissues above and below the urethral opening (Fig. 794). In case the tension is too great, a longitudinal incision can be made on either side just outside the row of sutures.

Albarran prefers the operation by two layers. He accordingly makes the elliptical incisions in the manner already described, and two transverse incisions, one at the upper border and one at the lower border of the elliptical incisions. The skin is then loosened from the lower tissues and three transverse sutures are passed through the subcutaneous tissues down to the urethra (Fig. 795). The sutures are then tied and buried, after which four sutures are passed through the skin flaps (Fig. 796) and ligated, thus completing the operation.

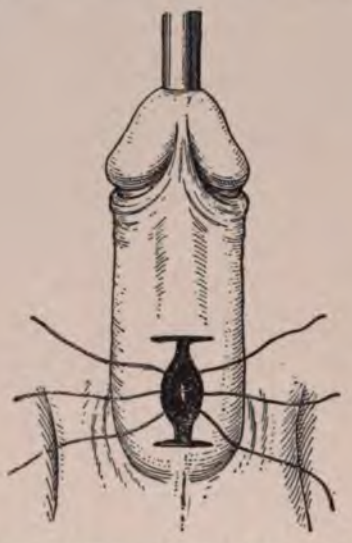


FIG. 795.—URETHRORRHAPHY. Shows the closing of a fistula by two layers. A transverse incision is made above and below the elliptical incision. Sutures are passed down through the subcutaneous tissues.

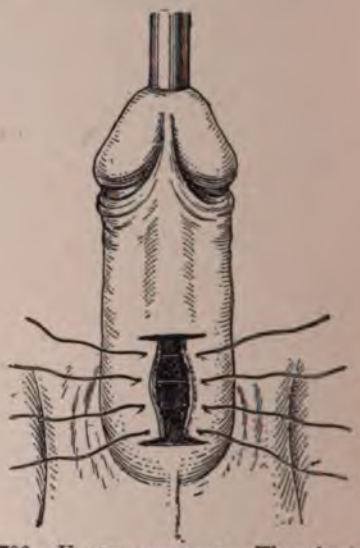
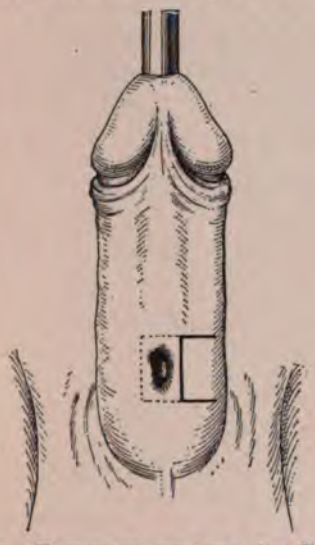


FIG. 796.—URETHRORRHAPHY. The subcutaneous tissues are tied and cutaneous sutures are passed and tied.

(b) URETHROPLASTY WITH ONE FLAP.—This consists in cutting out a rec tangular piece of skin about the fistula, freshening the edges of the fistula do to the urethra and then making a flap by transverse incisions extending fr the upper and lower margins of the removed skin and parallel to them (F 797). After this follows the dissecting free of the flap, passing four sutu through its side and the other side of the wound (Fig. 798) and then tying sutures, thus making a covering for the fistula.

(c) URETHROPLASTY WITH TWO FLAPS.—A wide transverse cutaneous cision is made well above the upper edge of the fistula and another at a cor sponding distance below it. A longitudinal incision is then made from the up to the lower transverse incision and a flap is dissected free on either side. Af this, a flap slightly longer than the raw surface about the fistula is marked

w it with its base pointing upward (Fig. 799). The lower flap is now ected free, lifted up so as to cover the fistula and its free edge is tucked



797.—URETHROPLASTY WITH ONE FLAP. A adrangular piece of skin is removed and the ges of the subcutaneous wound freshened so to slope down to the urethra.

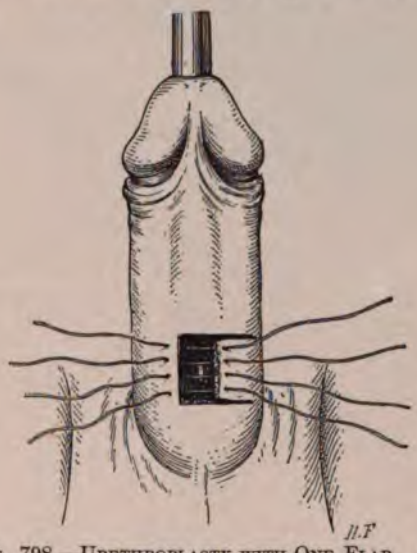


FIG. 798.—URETHROPLASTY WITH ONE FLAP. A side flap is made with its base away from the fistula. The flap is freed, sutures passed through it and the other side of the wound and tied, thus covering the fistula.

ath the upper transverse incision and fastened there by two sutures (Fig. ). The two lateral flaps are now drawn over the lower flap just made and ed by sutures, after which sutures are passed through the skin bordering

799.—URETHROPLASTY WITH O FLAPS. The first step of double flap operation shows lateral flaps reflected back the lower flap marked out, base pointing upward.

FIG. 800.—URETHROPLASTY WITH TWO FLAPS. The second step shows the lower flap doubled over the fistula tucked beneath the upper margin of the wound and made fast.

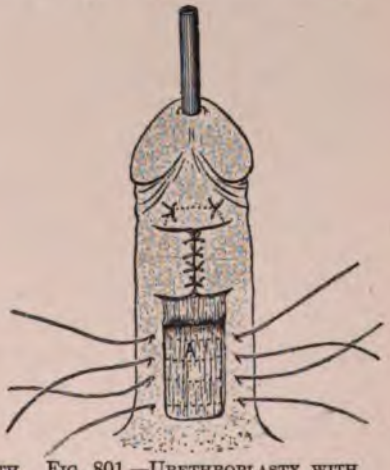


FIG. 801.—URETHROPLASTY WITH TWO FLAPS. The third step consists in bringing together and suturing the two lateral flaps and passing approximation sutures through sides of the denuded area.

the raw surface below and they are approximated as much as possible without making undue pressure (Fig. 801).

The fistulas can also be cured by slitting up or freshening the opening, then closing it with a purse-string suture and inserting the catheter as above.

Fistulas of the pendulous urethra situated between the glans and the scrotum can be treated in the same way in case they are small, but when they are larger a plastic operation is preferable.

*Electrical Treatment.*—The electrical treatment of fistulas situated by the side of the frenum often gives good results. The technique is as follows: Insert a dull pointed needle electrode, connected with the negative pole of a galvanic battery, into the fistula, and turn on the current. After the electrolytic action has taken place for a few seconds, it can be discontinued and a small soft-rubber catheter inserted through the urethra into the bladder and retained for a few days to prevent the force of the urinary stream from again dilating the fistula. It is well to cut any stricture of the meatus or in front of the fossa navicularis that may be present before beginning any operative procedure, in order to take the strain off the fistula during micturition.

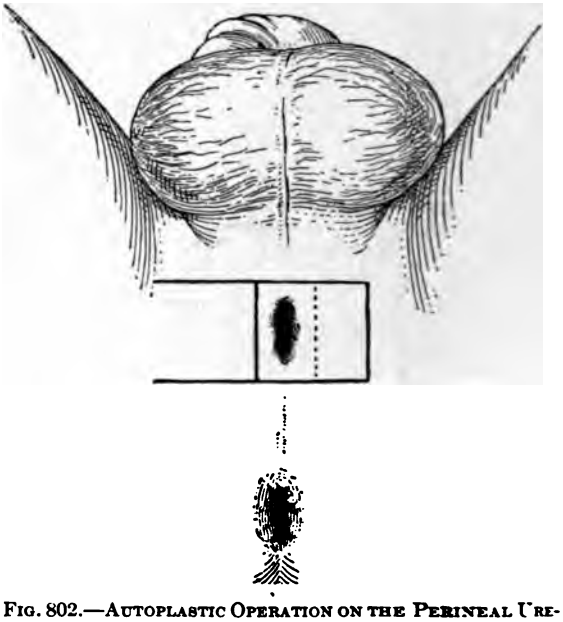


FIG. 802.—AUTOPLASTIC OPERATION ON THE PERINEAL URETHRA. Shows a rectangular skin area about the fistula to be cut away, a short flap marked out on the right with its base pointing inward and a long flap with its base pointing outward.

(2) *Fistulas of the Scrotal Urethra.*—In the treatment of fistulas of the scrotal urethra no exact rules for operation can be given. The operative procedure best adapted for the given case depends upon the size of the external opening, the length of the fistulous tract and the amount of induration present. Any operation described in connection with fistulas of the pendulous or perineal portion of the urethra most fitting to the case should be employed. I have usually employed the operation which I have described as perineorrhaphy in the male.

(3) *Perineo-bulbous Portion of the Urethra.*—Fistulas of the perineal urethra can also be treated by autoplastic operation, but I doubt its efficiency in this location on account of the depth of the tissues; nevertheless, I will describe it briefly.

*Autoplastic Operation.*—A rectangular area of skin is removed about the mouth of a central fistula in the perineum. A flap is made on the left side of the raw surface with its base toward the median line and another on the right side with its base away from the median line (Fig. 802). The flap on the left is now reflected over the urethra and sewed to the subcutaneous tissue on the right side and also to the skin above and below. Long transverse sutures are now passed from the skin on one side of the wound to the flap on the other (Fig. 803), which are then approximated and tied (Fig. 804).

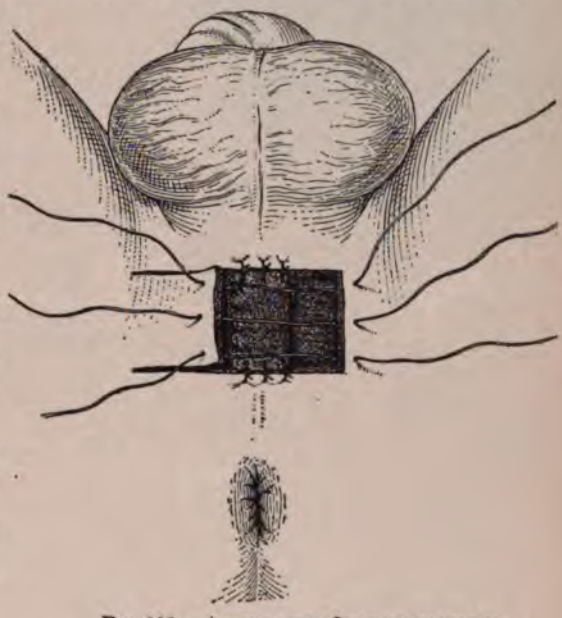


Fig. 803.—Autoplastic Operation on the Perineal Urethra. Shows the rectangular area of skin cut away and the short flap folded over the urethra and made fast and transverse sutures passed transversely through the two lateral skin surfaces.

*Deep operations on the perineal urethra*, such as perineal section, with the excision of the fistulas and of dense masses of fibrous tissue, give the most satisfactory results.

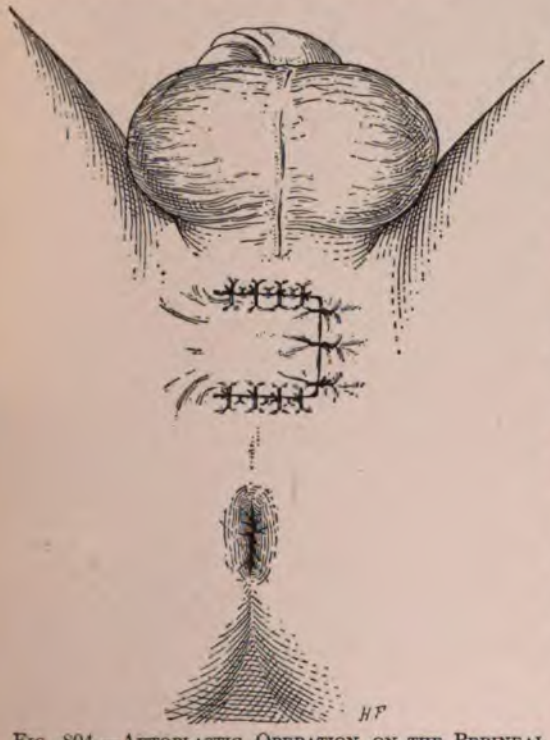


Fig. 804.—Autoplastic Operation on the Perineal Urethra. Shows the approximated skin surfaces united and made fast above and below.

The patient having been placed in the lithotomy position, any strictures of the urethra present are detected and the external and internal openings of the fistula are located.

A grooved metal guide is then passed down the urethral canal into the bladder. A median perineal incision should then be made through all the tissues, opening the canal on the guide and cutting the strictures in this locality. If a small meatus or any narrowings in the anterior

part of the canal are present, they are then cut to a 30 French size or larger. Sounds should then be passed to a similar size. I generally enlarge strictures to 32 French to allow for contraction during the healing process. The fistulas are then cut away with curved scissors down to the urethra, or split from their external openings into the urethra, their tracts curetted with a sharp curette and their edges trimmed away with curved scissors (Fig. 805). If there are but one or two fistulas and not much induration in the perineum, this will suffice, and a perineal tube can be passed through the incision into the bladder and kept there for a few days, after which it is withdrawn and a soft-rubber coudé catheter, No. 26 French, is introduced through the external meatus and passed the entire length of the canal into the bladder to remain for another week or more while the fibrous tissue about the perineal urethra is undergoing absorption. A small gauze drain is kept in the perineal opening until the urethra has healed.

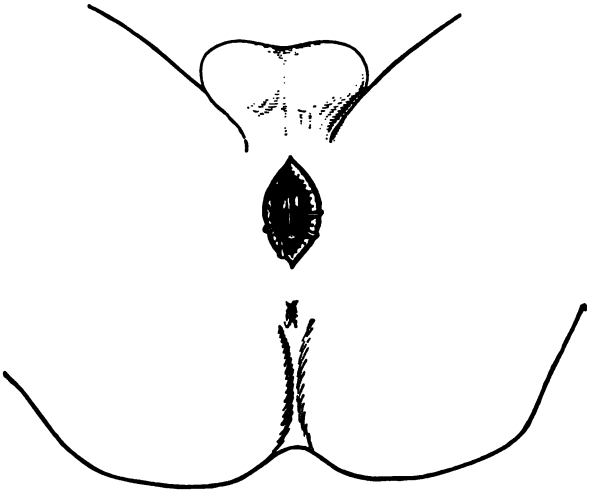


Fig. 805.—Perineal Incision, Showing Fistulas Extending down to Urethra.

*Perineorrhaphy in the Male.*—In case there is a quantity of hard and nodular scar tissue in the perineum, it is necessary to make a more complete operation. I often make a straight perineal incision down to the urethra in the center of the perineum and then make two elliptical incisions on either side of the central incision, through all the tissues to the canal, in a shelving or sloping direction, at the same time dissecting away the scar tissue. I then insert a catheter, No. 22 to 24 French, through the urethra into the bladder and

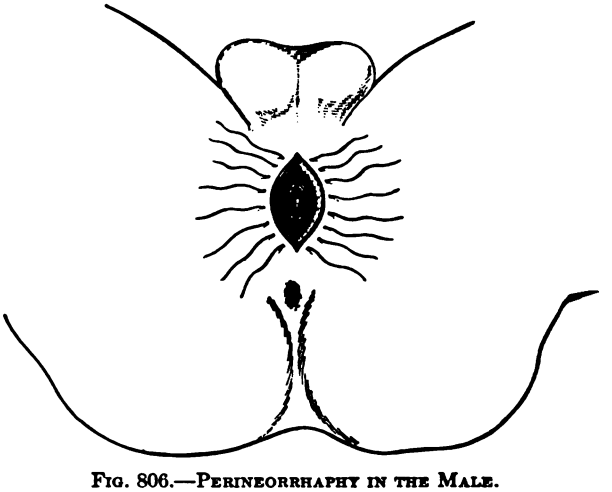


Fig. 806.—Perineorrhaphy in the Male. Showing the placing of the deep sutures.

close the perineum by interrupted sutures. These sutures pass through all the perineal tissues down to but not including the urethral wall (Fig. 806). The perineal tissue is often so thick that it will not come together easily, and the thighs have to be brought together and somewhat extended in order to better approximate the sides of the wound before tying the sutures and thus to

FIG. 807.—PERINEORRHAPHY IN THE MALE. Showing how the perineal tissues are approximated. (From Hartman.)

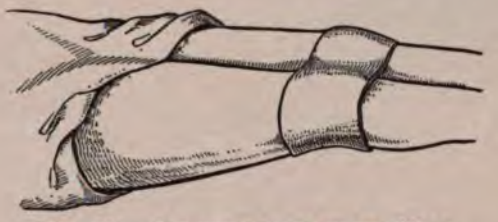


FIG. 808.—PERINEORRHAPHY IN THE MALE. Showing the knees strapped together.

secure better union. Fig. 807 shows approximation. After the perineum has been firmly united, bands of adhesive plaster should be passed around the patient's knees to hold them together and prevent him from splitting the wound open again (Fig. 808). The catheter should not be withdrawn until deep union has taken place, which requires about two weeks' time. If not successful, the operation should be repeated. I usually do not perform perineorrhaphy until after the operation of external perineal urethrotomy with dissection of the fistulas has failed. It is usually a waste of time to try to cure these old and tortuous fistulas in the perineum by simply keeping a retained catheter in the urethra either alone or associated with curetting the fistula, or making application of the cautery to its edges, or injecting the fistulous tracts with nitrate of silver or zinc-chlorid solution or tincture of iodin.

*Electrolysis* is usually of but little value in the treatment of perineal fistulas, although on one occasion I cured a perineal fistula two and a half inches long in a tabetic by one treatment, using electrolysis. The negative pole of a galvanic battery was inserted from the perineum through the fistula into the urethra and the current turned on until the electrolytic action had taken place. A retained catheter was left in the urethra for a week. The patient was then allowed to urinate without opening the fistula, the walls of which had grown together by an adhesive inflammation.

(4) **Urethro-Rectal Fistulas.**—ETIOLOGY.—Traumatism, suppuration, tuberculosis and neoplasms are the most frequent causes of urethro-rectal fistulas. Traumatism may be caused by calculi, by foreign bodies introduced into the urethra or rectum, by rupture of the prostatic or membranous urethras, or by instruments in examination, treatment or operation. The most common operations causing fistulas are perineal prostatectomy and perineal urethrotomy.

Prostatic abscess is said to be another cause, through breaking both into the prostatic urethra and rectum. I have, however, never seen a case in which I felt certain that such a condition existed. It is probable that malignant growths and traumatism are the most frequent causes of a noticeable fistula.

Pathology.—The opening into the urethra is usually small in traumatic cases and large in suppurative ones. The rectal opening is usually just above the sphincter, at times hidden in a mucous fold. At times there are three

Fig. 809.—Perineal Incision for the Operation on the Recto-urethral Fistula.

openings, one in the perineum, one in the rectum and the other in the urethra. The space between the rectum and the urethra is often very thin on account of the adhesions of the two walls, while at other times the walls are easily separated from each other when the fistulous tract is well marked, except at the site of the fistula. Sometimes there are marked thickenings.

Symptoms.—In the case of a fistula through the prostate due to prostatic abscess, the passage of the urine into the rectum is not noticed as much as when it is the result of malignancy. The most abundant leakage takes place in malignant cases with ulceration, and if much urine escapes into the rectum, a troublesome proctitis may take place. Sometimes the semen may also flow into the rectum, and fecal matter and gas escape through the urethra when urinating.

Examination.—Examination by the rectal touch often shows a papule or some granulations on or just below the prostate. The gland has an irregular feel as if there had been a loss of tissue in the case of abscess or tuberculosis, or a nodular ulcerating feel in the case of malignancy. In cancerous cases,

however, the fistula is more liable to originate from a growth in the rectum than in the prostate. The rectal speculum may show an irregular prominence or perhaps the fistulous opening. If the rectum is washed clean and then a second washing is made after urinating, urea can be found in the washings.

TREATMENT.—Remove obstacles, such as strictures of the urethra. Make instillations of nitrate-of-silver solution into the prostatic urethra. Regulate the bowels and give cleansing enemas of antiseptic solutions.

The operative procedures are as follows: A simple transverse incision is made in the perineum and a longitudinal one extending from it in the median line toward the scrotum (Fig. 809). Separate the tissues up to and above the fistula, thus separating the rectum from the urethra. Free and ligate the fis-

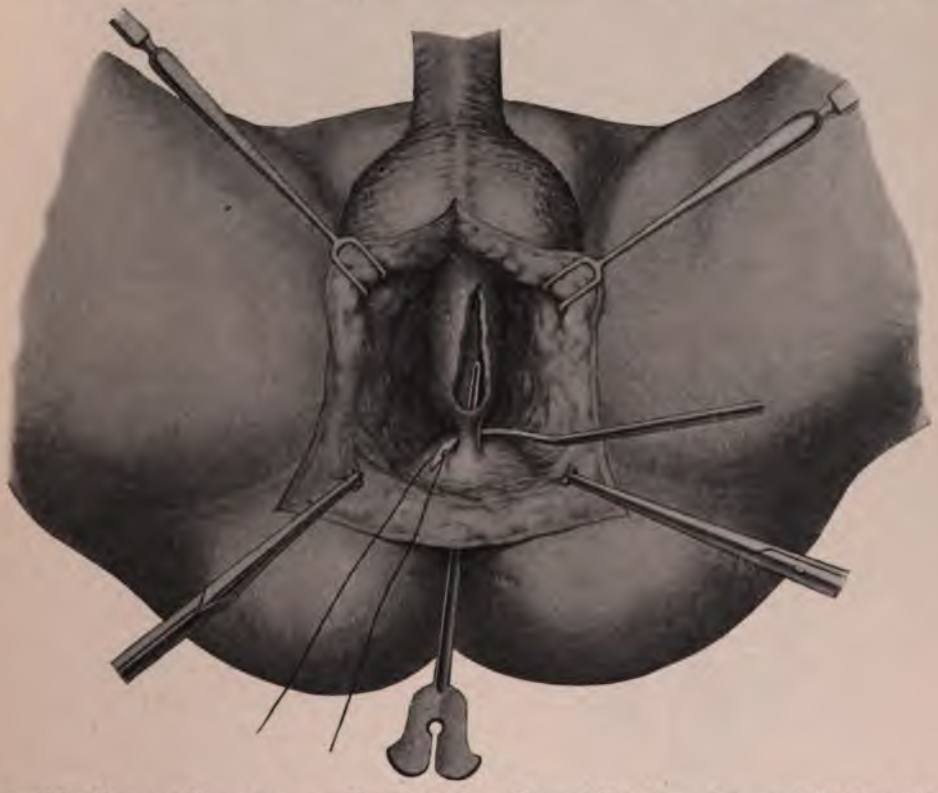


FIG. 810.—FIELD OF OPERATION FOR URETHRO-RECTAL FISTULA EXPOSED. A grooved director pushed from the rectum through the fistulous opening into the urethra and a ligature carrier drawing the ligature about the fistulous tract.

tulous tract if it is of any length (Fig. 810), then cut through it between the ligatures and sew up each fistulous opening separately (Fig. 811). The rectal part should be sewed with the Lembert suture; after which the skin should be closed with interrupted sutures (Fig. 812). In most of the cases in which these fistulous openings have taken place during a perineal operation, the urethra and

the rectum have been so closely adherent as to have formed practically a single membrane and to have been the direct cause of the production of the injury, and it would consequently be very hard to separate them. In such cases, the re-

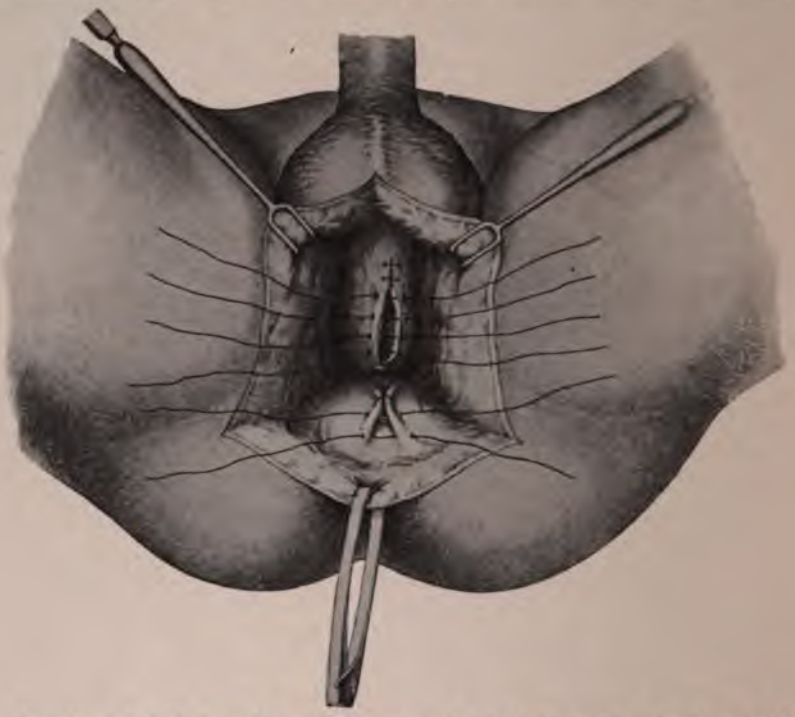


FIG. 811.—OPERATION FOR URETHRO-RECTAL FISTULA. Showing the sutures passed through the urethra and rectum after the fistulous tract has been cut through.

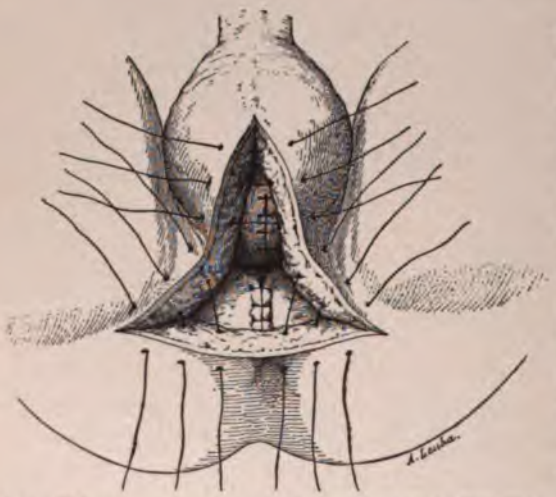


FIG. 812.—OPERATION FOR URETHRO-RECTAL FISTULA. Showing the rectal and urethral sutures tied and the skin sutures passed.

pair of the injury should be done while the tissues are in a fresh condition and sutures should be placed through the perineal opening in such a way as to shut off the rectum without passing the suture through it. A catheter *à demeure* should be introduced through the urethra into the bladder which will keep the urine from the seat of the operation. (See Accidents During Urethrotomy, cutting into the Rectum.) The bowels should not be moved for several days. In all cases, except malignant, which are due

to pathological conditions, an endeavor should be made to separate and sew up the two openings individually.

(5) **Urethro-Vaginal Fistulas.**—These are very rare and generally occur at the time of childbirth, in the ratio of 1 to 1,000 cases. They sometimes follow operations of urethrocele.

SYMPTOMS.—The symptoms are not marked, usually, as only a few drops of urine escape during micturition, and are those of vaginitis and vulvitis.

EXAMINATION.—The fistulous opening can usually be seen with either the vaginal or urethral speculum and a probe passed through the fistula.

TREATMENT.—Recent fistulas can be cured often by the retained catheter, or by touching up the sides with a silver-nitrate solution. When the opening is large, it can be cured by sutures the same as the vesico-vaginal fistulas.

# CHAPTER LXII

## AFFECTIONS OF COWPER'S GLANDS

COWPER'S glands, or the glands of Mery, also known as the bulbo-cavernous, are analogous to the vulvo-vaginal glands in the female, or those of Bartholin.

**Anatomy.**—As has already been described in the chapter on Anatomy, they are ovoid bodies 5 to 8 mm. in diameter, lying between two layers of the triangular ligament, surrounded by the fibers of the compressor-urethræ muscle. The duct from each gland is nearly an inch in length. It extends forward between the bulbous and membranous urethra and then within the wall of the bulb itself, and finally beneath the mucous membrane of the urethra, which it pierces with slitlike orifices. Sometimes the two ducts unite, forming a single opening in the urethra. Their blood supply is derived from branches of the internal pudic artery. The lymphatics belong to the internal iliac lymphatic system.

**Physiology.**—Cowper's glands are accessory sexual glands of the tubo-alveolar type, and secrete a clear viscid fluid, alkaline in reaction. This mixes with the secretions of the other accessory reproductive glands, such as the vesicles and the prostate, and helps to preserve the motility of the spermatozoa.

**Pathology.**—The inflammations of Cowper's glands include gonorrheal, tuberculous and mixed infections, besides which there are benign and malignant tumors and retention cysts. The diseases to which the glands are especially liable, according to the cases that have been reported up to the present time, are acute and chronic Cowperitis, retention cysts and cancer.

**Acute Cowperitis.**—This is an inflammation of the lining membrane of the ducts and the acini of the glands, and represents one of the rarer complications of gonococcal urethritis. A very acute inflammation is rare and it is usually subacute.

ETIOLOGY.—It is due to an extension of an acute gonorrheal inflammation from the urethra during the stage of decline. It usually takes place about the third or fourth week of the disease, but exceptionally appears in the chronic stage. The contributing causes of Cowperitis include all forms of traumatism affecting the gland, such as horseback riding, bicycling and injudicious treatment. The disease is unilateral in the majority of cases.

Symptoms.—When Cowper's gland is involved in the inflammatory process, the pain varies from a slight degree, together with a sensation of fullness in the perineum, to a severe sharp pain between the thighs, which is aggravated on motion and on defecation. Examination may show a small, well-defined, rather hard swelling in the region of the gland. Bi-digital examination, with the forefinger in the rectum just below the prostate on one side and the thumb on the perineum, gives rise to tenderness (Fig. 813).

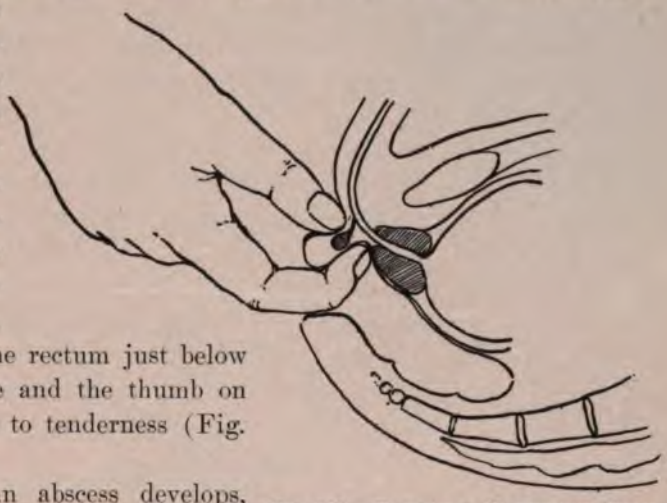


Fig. 813.—Bi-digital Manner of Examining Cowper's Gland.

*Abscess.*—In case an abscess develops, which is very rare, it is accompanied by increased pain and swelling and also by chills, fever and general malaise. The abscess, as it enlarges, extends over toward the other side to a varying degree. The signs of a diffuse suppuration appear in the perineum, which becomes painful, red and swollen. It may press against the urethra to such an extent as to cause dysuria with increased frequency, or even retention of urine. The constitutional disturbances, such as chills, fever and sweating, continue and may be quite severe.

Course.—Spontaneous rupture may take place outward toward the perineum, or inward into the urethra, or backward into the rectum (Fig. 814). The abscess may discharge into the canal through the ducts or burst directly into it. In the latter case, urine may enter the abscess cavity and give rise to extravasation of urine; but usually, when the abscess bursts into the urethra, the pus drains through the urethral canal and the cavity gradually heals. In either case, after the pus has been discharged through the canal, the abscess may heal spontaneously. In some instances, the abscess breaks both outward and inward, and then a urinary fistula results. The abscess is sometimes very subacute in character, in which case the process advances very slowly and there is but little pain and but slight or normal temperature. Such an abscess may, however, cause considerable

Fig. 814.—Acute Cowperitis. The abscess may break inward into the urethra, outward in the perineum, or backward into the rectum.

interference in urination. It finally breaks down and suppurates unless incised. Bi-digital examination shows, in the case of an acute abscess, a diffuse mass in the membranous portion between the layers of the triangular ligament below the prostate, and in the second case, which is of slower formation, a more circumscribed mass or nodule. When it breaks externally, it generally points on the perineum.

TREATMENT.—The treatment of acute Cowperitis consists in hot sitz baths twice daily and appropriate measures for the relief of pain and dysuria, such as a mixture of codein or morphin with belladonna and an alkaline diuretic

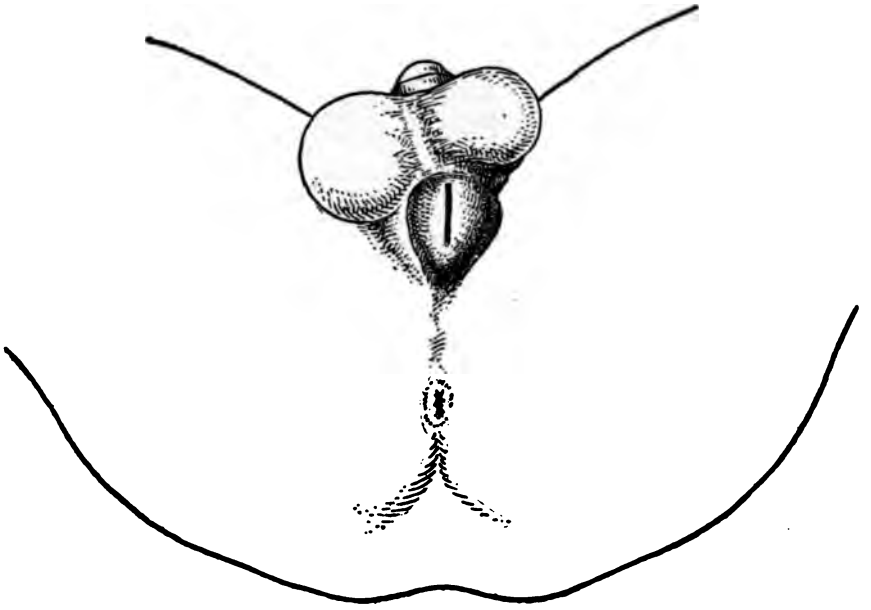


FIG. 815.—AN ABSCESS OF COWPER'S GLAND POINTING INTO THE PERINEUM. It should be incised.

or a belladonna and opium suppository. All urethral treatment should be discontinued. The bowels should be kept open with saline laxatives and aperient waters. When the swelling invades the perineum, hot poultices should be applied, and, as soon as fluctuation is felt, a perineal incision is made (Fig. 815) and the abscess evacuated and drained with gauze.

**Chronic Cowperitis.**—This condition is the continuation of an acute process and, according to Pasteau, contributes to many persistent cases of urethritis. Haas recommends the following method for examining patients in whom this condition is suspected: The patient urinates and the first urine is examined for pathological urethral products. The patient's urethra and bladder are then washed out with a 1 : 2,000 solution of oxycyanid of mercury, part of which the patient voids. The glands are then massaged, after which the patient voids the remaining fluid from the bladder, which is examined for shreds and

then centrifuged and stained for gonococci. Haas found gonococci in each suspected case that he examined.

TREATMENT.—The method employed by Haas in treating this trouble is by giving bi-digital massage; by dilating the urethra in the region of the mouths of the ducts and then giving a general urethral irrigation; and by instillations of nitrate-of-silver solution from 1 : 500 to 1 : 100 to the patient's urethra, in case it is affected.

GENERAL HYGIENIC MEASURES.—Nonstimulating diet, avoidance of constipation and of all causes of pelvic congestion, such as sexual excess, horseback riding or prolonged bicycling.

**Cancer of Cowper's Gland.**—Only a few cases of this trouble have been reported. It usually appears in the form of a cylindroma, a hard, movable and encapsulated tumor, which, as it increases in size, becomes adherent to the adjacent tissues. At the onset there is no pain, but, as the growth increases in size and presses upon the urethra, it causes pain and difficult urination, besides interfering with defecation and rendering locomotion and sitting inconvenient and painful. Later on the lymphatics become involved, especially those of the internal iliac system. Cancer of Cowper's gland is distinguished from cancer of the urethra by the fact that at first it grows toward the skin and the rectum and does not interfere with the free flow of urine or the passing of instruments, until it has reached a large size.

The TREATMENT consists in the removal of the gland, but it is doubtful if this does more than relieve the local symptoms of discomfort and obstruction if the operation is successful. There is great danger of wounding the urethra and causing a fistula.

Any tumor developing in Cowper's gland is probably a carcinoma and should therefore be removed as early as possible to prevent symptoms of obstruction.

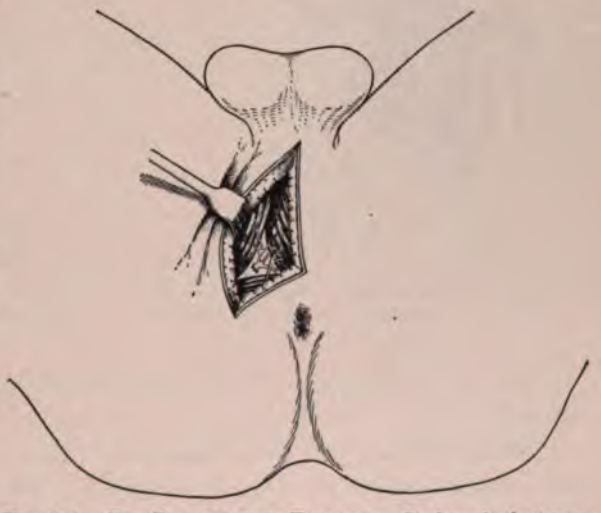


FIG. 816.—THE PARABULBOUS TRIANGLE. Its base is the transversus perinei muscle. Its inner side is the accelerator urinæ and the outer side the erector penis. They converge to form its apex.

The operation of Cowperectomy consists in placing the patient in the lithotomy position, making a vertical incision down to the bulb, the same as would be made for a perineal section. At the lower end of this incision, a shorter oblique cut is made downward and outward, forming an obtuse

angle. The outer side of this angular incision is now retracted and the tissues dissected so as to bring the operator down to what I call the parabulbar triangle. This is bounded below by the transversus perinei muscle, its base, and on the inner side by the accelerator-urinæ muscle and on the outer side by the erector penis muscle, which two muscles converge forming its apex (Fig. 816). A branch of the superficial perineal artery is here seen and ligated.

The tissues are then retracted and an incision made over the gland, which can be felt by palpation in the angle formed by the transversus perinei and accelerator muscles (Fig. 817). The gland is then freed, seized with thumb forceps and delivered, after which its duct is cut through with scissors, thus allowing its removal (Fig. 818).

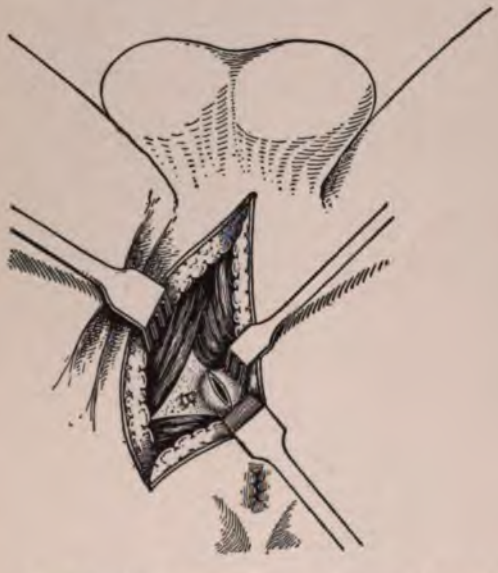


FIG. 817.—COWPERECTOMY. The tissues retracted and an incision made over Cowper's gland.

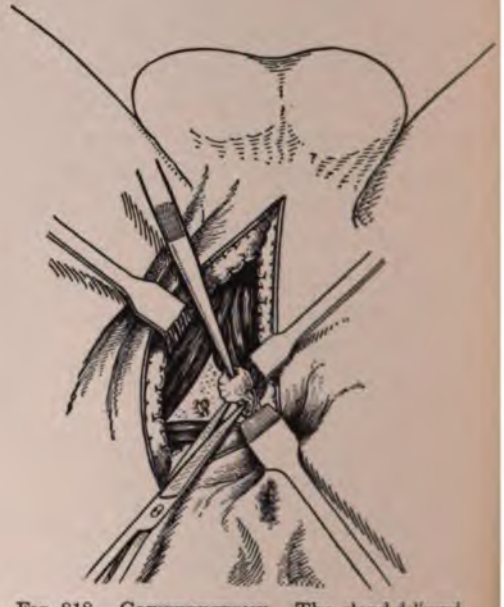


FIG. 818.—COWPERECTOMY. The gland delivered and the scissors ready to cut through its duct.

If a *cyst* is present, it is necessary simply to incise it and swab its interior out with carbolic and alcohol.

**Present Status of these Diseases.**—The affections of Cowper's glands have never been extensively investigated. Those that have been most thoroughly studied and are consequently the best understood are acute and chronic Cowperitis, abscess and cancer. There is but one recorded case of tuberculous infection of Cowper's gland, which was reported by Hallé and Motz in an article on tuberculosis of the urethra. Dr. E. L. Hatch, who is connected with my clinic at the New York Post-Graduate Medical School, has examined a very large number of glands bi-digitally without finding any enlargement. He has also examined numerous glands removed from the cadaver, but has never as

yet been able to find either gonococci or tubercle bacilli present. The literature of the subject and my own personal investigations lead me to believe that, excepting a mild form of Cowperitis associated with gonococcal urethritis, the diseases of Cowper's glands are very rare.

It must not be forgotten, however, that an examination of Cowper's glands should form a routine part of the examination of a patient suffering from a genito-urinary disease, as occasionally the annoying perineal pain that patients complain of is due to an involvement of these glands which are so deeply inclosed in the perineum between the layers of the triangular ligament.

# CHAPTER LXIII

## GONORRHEA IN THE FEMALE

Gonorrhea in the female is a much more complicated and serious condition than in the male. In the male, it begins at the meatus, or external opening of a canal common to the urinary and genital tracts, and it extends up along this passage as far as the genito-urinary sinus, the point at which the genital and urinary tracts join in the posterior part of the urethra, just below the bladder at the opening of the ejaculatory ducts. In the female, on the other hand, there are two distinct tracts which open into the vulva. This outside vestibule contains between its labia the entrance of the vagina and the meatus of the urethra (Fig. 819).

Fig. 819.—External Genitals in the Female.

The part of the urinary tract usually involved in gonorrhea in adult females is the urethra; whereas, in the genital tract, it is the endocervical canal. One or both may be involved, but most frequently the urethra, although I believe gonorrhea in the female is more a disease of the genital tract than of the urinary tract in chronic cases.

The involvement of the genital tract above the cervix of the uterus and especially of the adnexa, as well as of the urinary tract above the urethra—that is, the bladder, ureters and kidneys—can be considered as complications of an important and serious nature; whereas involvements of the vulva and vagina come under the head of minor complications. An associated inflammation of the vulvo-vaginal glands (glands of Bartholin) is of common occurrence. The discharge seen in the vagina is principally an accumulation of inflammatory products flowing from the uterus, whereas that seen in the vulva is the flow from the uterus, the urethra or both.

Gonococcal vulvitis, vaginitis and vulvo-vaginitis are most common in women after the menopause and in girls before menstruation has begun. During adult life, the childbearing period, vulvitis and vaginitis are exceedingly

rare. When they do occur, they are the result of gonococcus infection, according to Bovée and some of the present writers; whereas Bumm and a number of the writers who have most extensively studied the subject say that the gonococcus never causes these conditions. It is said that the epithelium of the vulva and vagina is of such a type that the gonococcus does not attack it, although it is claimed that after the outer cells have been macerated by the pus flowing down from the cervix, a gonococcal vaginitis and vulvitis may develop. Vulvo-vaginitis will be further considered under the heading of Gonorrhea in Children.

**Statistics.**—It is estimated that at least fifty per cent of the adult population of this country have suffered from gonococcal infection. According to Neisser, it accounts for from fifty to seventy per cent of the cases of all venereal diseases, in spite of the difficulty of obtaining accurate statistical data. It is conceded that more men than women are infected, but the difference is not as great as indicated by statistics. The diagnosis of gonorrhea in the female is not so easy as in the male, and the difficulty of compiling statistics is correspondingly difficult. In the opinion of Nöggerath, at about the time of the discovery of the gonococcus, eighty per cent of all men had or had had gonorrhea and infected their wives. This was probably overdrawn, as I have never found anything approaching such a condition of affairs. According to Erb, writing thirty years later, among 400 cases in which the husbands had gonorrhea before marriage, only 4.25 per cent of the women developed the disease, whereas 93.75 per cent remained well or developed pelvic trouble from other causes.

"Brunseke and Seifert, in the Würzburg Clinic, found, among 200 cases, infection of urethra in 90 per cent; of the cervix in 37.5 per cent, and of Bartholin's gland in 12.5 per cent." (Findlay.)

Reichel, among 320 cases of gonorrhea in prostitutes, found an infection of the cervix alone in 4.5 per cent; together with Bartholinitis, in 9.5 per cent; together with urethritis, in 30 per cent; together with urethritis and Bartholinitis, in 50 per cent.

Bumm, in his observations of 74 gonorrheal women for at least five months until cured, noted 69 cases (93 per cent) of infection of the urethra; 53 cases (70 per cent) of infection of the cervix; 16 cases (23 per cent) of infection of the corpus uteri; 7 cases (10 per cent) of infection of the Fallopian tubes.

**Etiology.**—Gonorrhea in the female, as in the male, is due to infection of the genito-urinary tract by the gonococcus, which usually takes place during coitus. If the introitus is small, the infection generally occurs first in the urethra; whereas if it is large, the cervical canal of the uterus is more likely to be infected and the primary seat of the infection. The infection may take place in both these points at the same time, or it begins in one of them and may or may not reach the other. One reason why gonorrhea is much more fre-

quent in the urethra than in the cervix alone is, first, because it is situated in a much more favorable position for infection and, second, because, in case of primary endocervical infection, the discharge from the cervix can easily flow down and infect the urethra, whereas when the urethra alone is involved, the discharge from the canal cannot easily run up and infect the cervix.

Contact with the seats of infected water-closets, towels, hands or instruments is more likely to take place in the female than in the male, and in this case the urethra is generally involved primarily. Children, nursed by mothers or maids having the disease, may be infected by them and develop gonococcal vulvo-vaginitis. No one is immune from the infection, although some people are more susceptible than others.

A woman may infect a man when she apparently does not have the disease, and *vice versa;* although, if she were examined just before or after her menstrual period, gonococci would probably be found, as at such times they become active, owing to the congestion present. Again, a woman and her husband may both have infected mucous membranes without any subjective symptoms, and yet if either were to have intercourse with a person having a healthy mucosa, he or she could be infected and might develop most acute symptoms. It frequently happens, however, that a man may infect his wife, cure himself and then be reinfected by her unless she has also been cured during the interval. Or, if the man has not been cured and she has been, he might reinfect her.

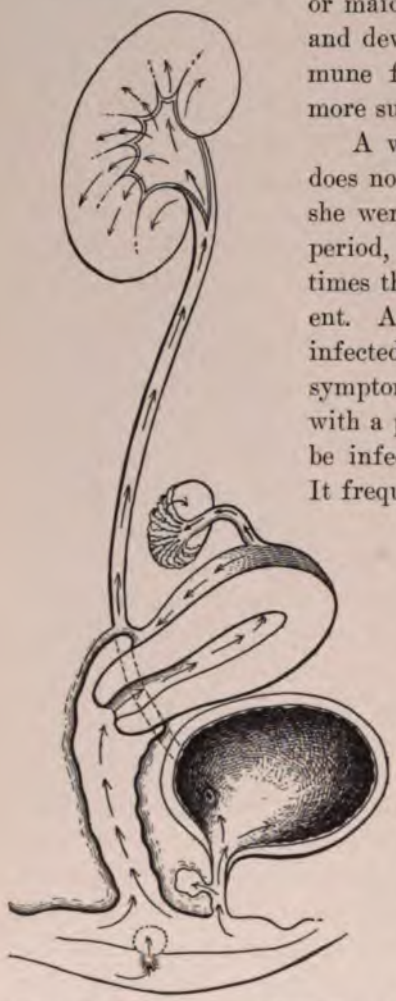


Fig. 820.—March of the Gonococcus through the Genito-urinary Tract in the Female.

The pathogenic agent of gonorrhea may live for years in the tissues and not become active until it has been made so through parturition or some other cause. When, however, the gonococcus is present in a walled-off cavity, as in pyosalpinx, it dies and the pus becomes sterile. Outside of the tissues, and especially in a dry medium, the gonococcus quickly dies, sometimes in a few minutes.

The period of incubation in women is from twelve hours to one week. Experimental inoculations have shown the disease to develop in from twelve to twenty-four hours. Fig. 820 shows the march of the gonococcus.

**Pathology.**—URETHRA.—In the acute stage, the gonococcus makes its way to the deeper structures of the mucosa. Later on, the germs confine their activity to isolated areas near the surface. The mucosa is red and swollen; considerable pus and epithelia are present in the discharge.

*Periurethral abscesses* are formed in Skene's glands. They are about the size of a large pea, corresponding to the parafrenal abscess in the male and point into the urethra or the vagina. Gonococci are present in the discharge, often with staphylococci.

Cystitis, ureteritis, pyelitis and pyelo-nephritis are uncommon complications. Pure gonococcal cystitis is very exceptional and some of the closest investigators, with a large amount of material, have never seen a case.

UTERUS.—*Cervical Endometrium.*—Next to the urethra, the cervical canal of the uterus is the favorite seat of the infection. The organ may present no outward changes on inspection. The cervical end is the portion principally affected and is clogged with discharge. In the acute stage, the surface is red and swollen, covered with a profuse secretion from the tubular cervical glands, which are enlarged in many of the cases and filled with pus. The mucosa in acute cervicitis is thrown into irregular elevations and the external os is surrounded by a reddened area and may be easily eroded, giving rise to hemorrhage. In the chronic stage, the cervical endometrium is not uniformly involved and the microscopical changes are not so marked.

*Corporal Endometrium.*—In the acute stage, the internal wall of the uterus is more or less thickened and reddened, and the surface is covered with an abundant purulent discharge. The muscular layer is infiltrated with serum as a result of inflammatory changes in the myometrium.

In chronic endometritis, the mucosa is uniformly thickened and often thrown into folds. It may be covered with shaggy villosities. The muscular layer is frequently hardened as the result of sclerotic changes in the blood vessels and cellular infiltration. The uterine walls may be thickened to twice the normal size. The thickening is uniform in all directions.

Wertheim performed hysterectomy in eight cases in which the gonococcus had been found in the uterine discharge. In all these uteri, the gonococcus was demonstrated between the superficial epithelia and in the subepithelial tissue of the uterine mucosa. No gonococci were found in the deep layers of the reticular connective tissue. The interglandular spaces were filled with pus and round cells.

Bumm says that in chronic endocervicitis the gonococci are confined to isolated areas in the mucosa, and the glands are not invaded. The gonococcus, according to him, invades the corporal more deeply than the cervical mucosa. Round-cell infiltration was demonstrable throughout.

TUBES.—The changes in the tubes resemble those of the uterus. There may be a well-marked round-cell infiltration of the mucous folds. The inflam-

mation may be of a catarrhal or suppurative type, and the condition is known accordingly as hydrosalpinx or pyosalpinx. The changes in the two tubes are not necessarily identical. One tube may represent a decided pyosalpinx; whereas there may apparently be an intense catarrhal salpingitis on the opposite side, sometimes severe enough to show an exudate of lymph on the peritoneal surface, with adhesions to the surrounding tissues. The gonococci are usually limited to the surface mucosa, but the condition is nevertheless an acute gonococcal salpingitis. The tube, including the fimbria, is red and swollen, and its consistency is increased. The mucosa on cross section is seen to be thickened and contains an excess of serum. As a result of the inflammatory changes, the tube loses its normal configuration and becomes tortuous and convoluted.

In chronic catarrhal salpingitis, the tube enlarges in all diameters, but its lumen is narrowed as the result of congestion and connective-tissue thickening. It may be partially or entirely obliterated and its occlusion may lead to hydrosalpinx. The tube then becomes sausage-shaped and may reach the size of a cocoanut, with thin and transparent walls.

In acute purulent salpingitis, the tube is reddened and thickened, surrounded by a film of fibrous plastic exudate, resulting in adhesions. Large accumulations of pus are present. When the condition becomes chronic, the color is lighter; but the tube is thicker and increased in consistency, due to circulatory changes and proliferation of connective tissue. The abdominal end of the tube may be obliterated. A mass of adhesions binds the convolutions of the organ together, as well as, perhaps, to the ovary, the bladder, the intestines and the uterus. Gonococci are found in the mucosa and sometimes in the mesosalpinx and in the exudate over the serous coat.

Ovary.—The ovary probably becomes involved by continuity, and is therefore usually found adherent to its tube, the two forming a mass more or less solidly bound to the surrounding tissue (salpingo-oöphoritis). The inflammation varies in intensity and abscesses may form. It is rare, however, for all the functionating ovarian tissue to be destroyed. The massive exudate surrounding the organ is probably derived from leakage of pus from the distal end of the Fallopian tube.

In acute cases, the ovary looks large and red; abscesses are sometimes seen in the follicles and connective-tissue stroma. In chronic oöphoritis, the enlarged organ is firmer and presents cystic changes, with perhaps abscesses and adhesions. Ovarian abscess is, as a rule, secondary to tubal abscess.

Gonococci are occasionally, though rarely, demonstrable in ovarian pus. Mixed infection sometimes takes place, such as gonococcal-streptococcal pyosalpinx.

The *peritoneum* has been successfully inoculated with cultures of the gonococcus, thus showing the possibility of a peritoneal complication. Mixed infection with the colon bacillus is apt to take place through adherent gut.

The pelvic peritoneum may be infected by leakage of pus from a pyosalpinx. There may be recurrent attacks of localized pelvic peritonitis. An intraperitoneal exudate may form behind the uterus, or between the uterus and the bladder. Douglas's pouch is the usual seat of pelvic peritonitis.

**Symptoms** (Especially Referring to the Urethra and Uterus).—Discharge is noticed at the vulva, to which point it gravitates, flowing from the urethra, the uterus or both. When the urethra is involved, there is a sensation of burning or pain on urination and a slight frequency, as the urethra is short and the inflammation consequently near the bladder sphincter. When the uterus is involved, there may be a feeling of pain, heaviness and downward pressure in the pelvis and a pain in the back. The patients often speak of these symptoms as leucorrhea, or state that the leucorrhea is much worse and that they have taken cold in the bladder. The subjective symptoms usually disappear in three or four weeks and yet pus may still be expressed from the urethra, or seen at the os uteri. The other symptoms are usually due to complications.

**Examination and Diagnosis.**—The patient is placed upon the table in the gynecological position. The URETHRA is first examined. The sides of the vulva should be separated and the urethral meatus inspected. If the inflammation is acute, the area between the labia minora, as well as the labia themselves, may appear red and swollen, due principally to the urethritis, in the same way that the glans and prepuce may appear red and edematous in a male case. This does not mean that the patient has a gonococcal vulvitis. A smear of the vulva should then be taken. The vulva should then be sponged with boric-acid solution until clean, and the forefinger of one hand inserted into the vagina to a point corresponding to the upper part of the urethra. The finger should then be drawn down over the urethra toward the meatus and at the same time the labia separated by the fingers of the other hand. The discharge appearing at the meatus should then be taken directly on a slide or by a platinum loop and placed on the slide. (See Fig. 115, Vol. I.) The urethral discharge as in the male contains more epithelia than pus in the beginning, with gonococci on and between the epithelia. Later, the order is reversed and there is more pus than epithelia. The gonococci are also more numerous and, in the pus cells, intracellular.

The urethra is tender when pressed upon. The discharge in acute cases is most abundant on the third or fourth day.

Chronic urethritis follows only in a small percentage of cases and then the urethra is thickened, but strictures are rare. The inflammation lingers in the urethral follicles. Gonococcal urethritis in women may disappear entirely in a few weeks or in less than a month without treatment, as the urethra is shorter and less intricate than in men.

The URINE is next examined. The patient should be instructed to pass

two specimens of urine of about two ounces each. The first urine shows the washings of the urethra and is cloudy or turbid, or clear with shreds. The second specimen, unless the bladder or kidneys are involved, is clear. (See Fig. 244, Vol. I.) The urethral glands (Skene's glands) are a hiding-place for gonococci. Their ducts can be seen as red papules and are a source of chronic discharge, as are the vulvo-vaginal glands.

Bartholinitis.—The glands of Bartholin are then examined by inserting one finger into the vagina and palpating the vulva on either side with the fingers of the other hand on the outside. An involvement of one or both of these glands is a frequent complication of gonorrhea in the female. The pressure on the gland may cause a discharge to escape from the duct, which should be taken on a slide for examination. Enlargement shows the presence of a cyst or abscess, both of which are rare. The cyst is especially rare and gives rise to but few symptoms, usually a feeling of vulvar obstruction and local discomfort. They sometimes reach a fairly large size, as is shown in Fig. 821. This was removed from a woman sixty-five years of age and shows its actual size. In the case of an abscess, the tenderness is more marked and the surrounding tissue is red and puffy. The abscess is usually the size of a small English walnut and sometimes that of a hen's egg (Fig. 822). If not opened, it bursts on the inner side of the labium. The inflammation in these cases is, however, usually confined to the duct, the orifice of which is red and swollen. It is seen about the middle of the side of the vaginal entrance, just external to the hymen. Pus may burrow to the perineum and break, leaving a sinus. The glands are usually not involved early, generally not until several weeks after the beginning of the disease.

Fig. 821.—Actual Size of a Cyst of Bartholin's Gland Removed from a Woman Aged 65.

There may be in some cases, especially the chronic, every sign of a gonococcal vulvo-vaginitis. The labia may be swollen and tender; erosions and even small ulcerations may be present and abscesses may form in their sebaceous and sweat glands; but the infection in the inflamed area will probably not be due to the gonococcus, but to some other pus-producing microbe.

Uterus: Endocervicitis and Endometritis.—In acute gonococcal endocervicitis, there is pain in the back and hypogastrium, the symptoms being more marked when the body of the uterus is also involved. The acute symptoms usually subside in a week. The gonococcus probably reaches the endo-

cervical canal shortly after coitus and the uterine cavity immediately after a menstrual period.

The speculum inserted in these cases shows the vaginal wall to be bathed in a discharge coming from the uterus. The cervix is seen to be red and

FIG. 822.—ABSCESS OF BARTHOLIN'S GLAND. (From Kelly.)

swollen, and a yellow discharge is present at the os. The discharge, taken on a platinum wire and placed on a slide and examined under a microscope, shows gonococci in acute cases.

The diagnosis of gonococcal endocervicitis and endometritis is often not made if the patients have but little inconvenience, except by those who are in the habit of making routine examinations. The patients usually complain of leucorrhea, aggravated by exertion.

In chronic cases, the cervix may be eroded. The discharge is of a gray color. The uterus is enlarged in some cases and not in others. It is usually enlarged and tender, especially during exacerbations. The discharge may show gonococci; but in case they are not found, repeated examinations should be made, remembering that the best time to find them is just after menstruation. A congestion may be brought on artificially by applying a ten-per-cent silver solution to the cervical canal. The increased discharge during the reaction will probably show gonococci if the disease is gonorrhea.

Gonococcal Salpingitis.—The gonococcus may reach the tubes in two weeks, in several years or never. Both tubes are generally involved (Findlay). The symptoms in gonococcal infection are extremely variable in character and degree. The onset is sometimes marked by a chill, fever and local pains. The patient may run a temperature of from 99° to 101° or from 101° to 103° F. for several days or weeks. Bimanual palpation shows great tenderness and is often impeded by muscular rigidity. The tube is felt as a thickened indurated body from the fundus of the uterus outward. A pus tube (pyosalpinx) often drops to the side and back of the uterus. It may reach the size of a lemon or larger. The mobility is decreased and there are adhesions with the adjacent structures. During menstruation, the tubes are tender and painful, as well as after exposure to cold and wet. The patient's general health is impaired, her powers of resistance and endurance are lessened, probably due to the involvement of the entire sexual apparatus. When both tubes are involved, occlusion of the lumen of the tubes and sterility are liable to follow.

Gonococcal Oöphoritis (Ovaritis).—The symptoms, aside from those of abscess of the follicles and the corpus luteum, resemble those outlined above. The tendency of gonococcal oöphoritis is to become chronic with acute exacerbations. A common outcome is sterility.

Gonococcal Peritonitis.—Peritoneal involvement is always a source of very intense pain. The menstrual periods are rendered painful through formations of adhesions, and the discharge may become very profuse as a result of the associated endometritis.

Bladder.—The bladder is very frequently involved in gonorrhea, but a true gonococcal cystitis is very rare. The infection is usually due to the colon bacillus.

Gonorrhea of the neck of the bladder, trigonitis, is not uncommon (Knorr), whereas an infection of the vesical fundus is rare. The occurrence of gonococcal pyelitis is exceptional.

Rectal gonorrhea was found by Baer in 38.2 per cent of all cases of gonorrhea in women (67 among 191 cases). All the patients were examined at least three times for the presence of the gonococcus in the rectum. According to Huber, 318 among 553 prostitutes (59.6 per cent) had gonorrhea, and among these, 24.5 per cent had also rectal gonorrhea.

**Relation of Gonorrhea to Pregnancy.**—As regards the influence of gonorrhea upon the course and termination of pregnancy, the infection tends to interfere with the normal course of gestation. Sänger believes that a large proportion of gonorrheal women miscarry. Gonococcal salpingitis may result in extra-uterine pregnancy. Puerperal sepsis, in one of seven cases, is due to gonorrhea, usually through the exacerbation and extension of a latent process. The protecting boundary of the internal os loses its efficiency during menstruation and in the puerperium.

**Gonorrhea and Sterility.**—A large number of sterile marriages are undoubtedly referable to gonococcal infection, although conception is not necessarily prevented by the existence of the disease. Gonorrhea of the cervix does not prevent pregnancy. According to the experience of Bovée, cervical gonorrhea extends to the body of the uterus in the majority of cases. In my opinion and that of many others, the infection in most cases does not extend to the body of the uterus. Lepmann holds that the internal os usually arrests the further spread of the infection; and Schultz states that among two hundred prostitutes with cervical gonorrhea, only thirty-eight per cent had gonorrhea of the uterus. Gonococcal endometritis and salpingitis are the most frequent causes of sterility in the female.

**Treatment of Gonorrhea in the Female.**—This applies more to urethral, vulvo-vaginal and uterine cases than to the adnexa and gynecological operations.

Urethra.—The symptoms of beginning urethritis in the female are usually not so marked as in the male. In case she presents herself at the beginning of her trouble, her discharge, like that of the male, consists of mucus, but few intracellular pus cells and many epithelial cells, with a few gonococci between or on them. The pus and gonococci then increase until the stage of recovery begins, when they again diminish in number.

*Abortive Treatment.*—The abortive treatment consists in washing the vulva with a 1:100 protargol solution or a 1:1,000 silver solution, and then the vagina. If there is no discharge from the cervix uteri or a discharge without gonococci, and none or but few pus cells, the vagina should be packed with gauze soaked in a saturated solution of boric acid or 1:10,000 bichlorid. Half a drachm of a solution of fifteen-per-cent protargol can then be injected into the urethra (Ultzmann syringe) and held there for five minutes.

Bierhoff uses a soluble urethral bougie of protargol in cocoa butter (1:20), which he passes into the urethra and keeps in place with a pad of absorbent cotton coaked in one-per-cent protargol. This is allowed to remain in place until the next urination. Bierhoff's treatment, which was a guide to me in the one that I have outlined, is much more complete. He advises the repetition of the abortive treatment in twenty-four hours. Two such treatments ought to show the urethral discharge free from gonococci. Bichlorid vaginal douches (1:2,000) are then given daily; hot sitz baths are also taken. If the gonococci return, the abortive treatment is repeated.

*Acute Urethritis.*—In case the patient is not seen until the acute stage of the urethritis has set in, or the abortive treatment has failed, it is advisable for her to lounge about the house for a few days, besides which she should take hot sitz baths twice a day, and saline laxatives to keep the bowels open. It is very important to protect the vulva and the vagina in order to prevent the infection from reaching the uterus, in case it is not already involved, as a gonococcal infection of this organ and its adnexa is far more serious than is the

urethral involvement. The best way to protect the vulva and vagina is by sponging the parts with a solution of bichlorid 1:2,000, and applying to the vulva pledgets soaked in 1:10,000 bichlorid, protargol 1:1,000, or silver nitrate 1:4,000. Dry antiseptic gauze is better if the wet dressing causes maceration of epithelia, in which case bichlorid or boric-acid gauze can be used.

Diet and Internal Treatment.—The diet is the same as for male patients and, internally, the same remedies are given as for the male: Sandalwood oil or copaiba in capsules or emulsion; or the potash and niter mixture. For tenesmus, the belladonna and potash mixture, or the belladonna and sandalwood-oil emulsion. (See chapter on Gonorrheal Urethritis in the Male.)

Urethral Hand Injection.—In the subacute stage, urethral injections of protargol one per cent, argyrol five per cent, silver nitrate 1:2,000, are given three times a day, to be held in for five minutes each time. If these are too strong for the patient, they should be diluted. An examination for gonococci should be made at each visit. When the gonococci are no longer found and no pus or but little is present, an astringent injection can be given until no discharge can be expressed from the canal. If the discharge persists and an examination for gonococci again shows their presence, the patient should again be put on injections of nitrate of silver or its derivatives. As little force as possible should be employed in making these injections.

*Chronic Urethritis.*—When the disease becomes chronic, the urethra should be examined for stricture, which, if present, should be dilated or cut. Strictures are rarely of much importance in the female urethra and dilatation is usually sufficient to relieve them.

If the discharge continues, the urethra should later be urethroscoped and local lesions noted. In case there are any infiltrations in the urethra, the canal should be stretched with a urethral dilator or a sound, and washed out with a silver-nitrate solution of a strength of 1:4,000 to 1:2,000; or after each dilatation, an application can be made to the urethra of a 1:100 to 1:20 silver solution, or of a solution of twenty-per-cent argyrol through the urethroscope to erosions, ulcerations or granulations, if present. In women, the urethra is larger and can tolerate stronger remedies than the male canal. I believe that vigorous treatment can be safely given the female urethra to destroy the infection in the early stage of gonococcal urethritis, also for the treatment of local lesions in chronic cases. An Ultzmann syringe without the cannula is used for urethral injections. This treatment does not apply to gonococcal disease of the cervix, which we should avoid overtreating. By packing the vagina or placing a suitable gauze dressing between the labia of the vulva, we can generally wall off the cervix and prevent the infection from reaching the cervical canal.

The ducts of Skene's glands, in cases of chronic infection, can be injected by means of a small dull hypodermic needle with a 1:20 silver solution.

It is also well to remember that, in gonorrhea in the female, it is much

safer to treat the short urethral canal than the cervical or cervico-corporal canal of the uterus; for the patient washes out the urethra from above when she urinates, leaving it sufficiently clean for treatment; but the uterine canal cannot be washed out from above, and therefore in the treatment of the endocervical passage, when a discharge is present, injections and applications may push the sepsis present in endocervicitis up into the canal of the body of the uterus and thus help infect the endometrium and tubes.

Uterus.—In *acute endocervicitis*, hot vaginal douches are indicated. Bichlorid solutions 1:3,000 are very effective, as are also boric-acid douches, a gallon twice a day. Vaginal tampons of ichthyol and glycerin (1:10), or boroglycerid, placed about the cervix, are also of benefit and can be kept in during the night. The douches should be given to patients in the recumbent position and the douche jar should not be too high. The nozzle should be behind the cervix; the duration of the douche should be from ten to fifteen minutes.

In the subacute stage, the inside of the cervical canal may be treated with applications or injections of a ten-per-cent solution of protargol, or a five- to ten-per-cent solution of silver nitrate, by means of Boldt's intrauterine applicating syringe. The application is made to the endocervical part of the canal.

Boldt's intrauterine applicating syringe resembles a hypodermic with a long nozzle. It is introduced into the endocervical canal with cotton wrapped about its applicating nozzle or shaft, and an injection is made into the cotton, called a tampon, which is allowed to remain in the canal, with a string attached, by which it can be pulled out later on.

I believe that a small gauze bag, just fitting over the nozzle of a syringe, with a piece of thread attached to it, is preferable. This bag is introduced, lubricated with glycerin or some sterile lubricant, after which the injection of protargol is made, the syringe nozzle slipped out, leaving the bag tampon in two or three hours. A boroglycerid tampon is then placed in the upper part of the vagina. In two or three hours, both the uterine and vaginal tampons are removed and a copious antiseptic vaginal douche given.

I do not believe in dilating the cervix in the office, washing out the endocervical canal, packing it with iodoform gauze or gauze soaked in a solution of one of the silver salts, or ichthyol and glycerin (1:10), and leaving the packing in until the following day and then repeating this treatment every few days. I also do not believe in curetting the uterus during the subacute stage, and think that this surgical measure should only be resorted to in chronic cases.

*Chronic Endocervicitis.*—In this condition, local treatment is better tolerated. Some recommend an application of a silver solution, two to five per cent, to the cervical canal every two days, or a ten-per-cent formalin solution;

whereas, for erosions of the cervix, a solution of ten-per-cent silver is applied. Findlay prefers application of ten to forty per cent formalin. All involved follicles and cysts of the cervix should be opened and cauterized.

*Corporal Endometritis.*—For acute and subacute endometritis, the same remedies are recommended as for endocervicitis, although personally I prefer not to use any instrument in the body of the uterus. In chronic cases, however, it is different, and curettage of the uterus is indicated, especially if menorrhagia or metrorrhagia are present. The cervix is first dilated, the interior of the uterus is curetted with a sharp or dull curette and a cleansing intrauterine douche with a bichlorid solution is given. Strong antiseptic solutions used as douches are not considered safe and, although I have never had any bad effect from their use, I have given them up and now after washing out the canal with salt solution I swab out the uterine cavity with pure carbolic and alcohol. This has been my method of treating these cases when sepsis is present, and I cannot recall a bad result. I do not, however, consider it necessary to use carbolic and alcohol in all mild cases. It must be remembered that the applicators should be spiral and that the one carrying the carbolic must have but a thin layer of cotton wound about it. A number of other applicators with a larger amount of cotton should be ready, so that they can be rapidly dipped into alcohol and inserted one after the other. The alcohol counteracts the cauterizing effect of the carbolic acid, as, unless the uterine cavity is quickly and thoroughly swabbed, the cauterizing effect of the carbolic might be too severe. It is not considered advisable in these cases to curette the uterus when the tubes are much involved, except for weakening metrorrhagia or before salpingectomy.

Salpingitis.—Rest in bed for pain, hot douches of salt solution, tampons of ichthyol and glycerin are recommended. In case the patient does not improve, discontinue the hot douches and keep the patient in bed with an ice bag as nearly over the tube as it can be placed on the abdomen. The bowels should be kept open with saline laxatives, and salol grs. v may be given three times a day. Suppositories of morphin and extract of belladonna can be given if there is much pain, or morphin and atropin by mouth or hypodermically. Pus tubes should be removed by laparotomy. When they are so distended as to bulge behind the uterus, they can be opened and drained by a posterior vaginal incision.

Vulva and Vagina.—When the vulva and vagina are involved, strong applications of ten per cent of silver can be made, or even stronger, and twenty-per-cent silver solution be applied to any ulcerations that may be present. Protargol solutions of a similar strength may be used, or argyrol fifty per cent. Pure aristol can be dusted on the vulva and absorbent cotton placed over to absorb the moisture. Black wash applied to pledgets of cotton is also good wet dressing.

The vulva and vagina are also irrigated with solutions of permanganate 1:1,000, or bichlorid solutions of a strength of 1:2,000. Solutions of permanganate 1:4,000, and bichlorid 1:10,000, can also be used on absorbent cotton as pledgets. When the pledgets are kept between the labia in this way, a sanitary vaginal pad and a supportive bandage should be used.

Gland of Bartholin.—If its duct is closed, causing a cyst above the orifice of the gland, this should be resected. If an abscess develops, it should be incised and swabbed out with carbolic and alcohol. The ducts can be split and cauterized if the inflammation in them remains chronic.

Ophthalmia.—Gonococcal ophthalmia is held responsible for a large percentage of the blindness in the world. The compulsory employment of Credé's method in the infant is a valuable safeguard against this complication.

The percentage of blindness due to ophthalmia neonatorum is variably computed from ten per cent to eighty per cent, according to different writers and localities. It is admittedly very high.

## GONOCOCCAL VULVO-VAGINITIS IN CHILDREN

The presence of a vulvo-vaginal discharge in little girls is not rare and is a highly contagious disease. It is due to a gonococcal infection in three quarters of the cases, the remainder being due to saprophytes. Hamilton found the upper part of the vagina had been invaded by the gonococcus in every one of forty cases in children examined by him; whereas the cervical canal, the endometrium and their adnexa are apparently very seldom infected in continuity. The infection is usually indirect through an infected nurse, a soiled bath towel, or bed linen, and is rarely the result of attempted coitus by infected adult males, as was formerly supposed. The course of the disease in children is relatively mild, due to certain anatomical and physiological peculiarities of the infantile organism. In the first place, the vagina is very short, and there are not many folds for the gonococcal secretions to lodge in. Glands through which the gonococcal poison may enter are very scantily represented. The vessels of the mucous membrane are as yet imperfectly developed. Other conditions favoring the gonococcal process are absent (menstruation, pregnancy, parturition). The patients are for the most part very young girls between two and ten years of age and in good general health. The average age of 344 patients examined by Hamilton in the children's department of the Vanderbilt Clinic during the past three years was 5.1 years; the youngest was three weeks, and the oldest twelve and one half years.

**Symptoms.**—The general and local manifestations are mild in most cases. Painful urination, redness and swelling of the vulva and a purulent discharge, generally thick and yellow, are observed, and, in rare instances, hemorrhage and vaginismus. The average duration of gonococcal vulvo-vaginitis in chil-

dren is between six and eight weeks. About one third of the cases become chronic. Hamilton states that a mucous discharge, so slight in amount as not to stain the clothing, may last and retain its infection indefinitely.

**Complications.**—The occurrence of complications is rare, but by no means exceptional. Rectal gonorrhea was observed by Flügel in 11 among 56 cases of gonococcal vulvo-vaginitis in children (twenty per cent). The infection usually takes place through the contamination of the rectum with the gonococcal secretion, by way of the perineum. The most common complications are gonococcal conjunctivitis and arthritis; the former, resulting in an ophthalmia, is a frequent cause of blindness. The latter usually involves only a few joints and runs a very favorable course. Complicating hemorrhages and irritative symptoms on the part of the peritoneum, lasting from one to eight days, have been noted. Other complications are urethritis and cystitis.

**Treatment.**—There is no specific local remedy, and the treatment consists in mechanical removal of the pus and keeping the affected parts clean by means of repeated vaginal irrigations. The solutions used for these irrigations are bichlorid of mercury 1:4,000, boric acid 1:30, potassium permanganate 1:1,000 or 1:2,000, silver nitrate 1:2,000. They should be given two to four times a day at first by the mother when there is a profuse discharge, using from one to eleven pints and lengthening the intervals as the discharge diminishes. Borated vaselin is useful in the presence of ulceration.

It is important in an institution in which the disease is very prevalent, to see that children having gonorrhea are supplied with a set of towels and vessels for their own exclusive use. The attendants should be cautioned against the danger of gonococcal ophthalmia.

## VACCINE THERAPY

According to recent findings, the local antiseptic treatment of gonorrhea in the female, especially little children, bids fair to be replaced by the more scientific and at the same time more efficient method of vaccine therapy. The discontinuation of local irrigations is especially desirable in cases of children and young girls. Stock vaccines may be used and are very easily administered. When used under ordinary aseptic precautions, they are apparently harmless. The time required for a cure in children is considerably shortened, as shown by Hamilton's table:

Average length of time under active treatment by the irrigation method: 260 cases, 10.1 months.

Average length of time under active treatment by the vaccine method: 8[illegible] cases, 1.7 months.

**General Consideration of Vaccines in Adults and Children.**—As such great interest during the last few years has been taken in the treatment of gon[illegible]

orrhea and its complications by vaccine and serum, it might be advisable to say a few words concerning them.

The principal groups of vaccines are auto-vaccine and standard (stock) vaccine. The first is prepared from the patient's own discharge and is not satisfactory. The latter is obtained from the discharge of a number of patients having the disease in the different stages and degrees of inflammation, and represents a combined vaccine which is kept in stock, and it is this stock vaccine that will be considered.

**Mode of Preparation.**—Pure cultures of the pathogenic bacteria are grown on suitable culture media; at a certain age, an infusion is made with sterile salt solution, and this is shaken up for one or more hours and then the gonococci are killed by careful sterilization at a suitable temperature, usually from 60° to 75° C. for one hour. All lumps are then removed and the germs counted. This is done by mixing equal parts of the suspension and of normal blood, diluting with salt solution, making smears, staining and counting blood corpuscles and bacteria in a large number of fields. The number of germs can also be calculated by means of the Thoma-Zeiss chamber, which is preferable, as requiring less time and yielding a more accurate result, and it is then mixed for the sake of better preservation with lysol (one quarter per cent) or phenol (one half per cent).

**Administration.**—In using the stock gonococcus vaccine, that of Parke-Davis is recommended. In the United States, this vaccine is marketed in bulbs, each containing 20,000,000, 100,000,000 and 500,000,000 bacteria. It is prepared from gonococcus cultures which have been tested and shown to possess immunizing properties. Up to date, the results obtained by stock vaccine are still far from the point where they can be unconditionally recommended to practitioners as of therapeutic value in all forms of the disease.

The vaccine is injected subcutaneously into the middle of the back by means of a sterile hypodermic syringe and needle. In beginning, the contents of one centimeter bulb containing 20,000,000 gonococci should be given. At the end of five or seven days, if no marked reaction has been produced by the initial injection, a second should be administered, containing 30,000,000; then continuing each five or seven days to increase the dose to 500,000,000 if there is no reaction. The results are probably better in gonococcal arthritis than in any other complication. Hamilton, in vulvo-vaginitis in children, used 50,000,000 of the Parke-Davis preparation to the initial dose.

The patient's age has no particular bearing on the dose.

In using the vaccine treatment in cases of gonorrhea in the adult, the results have been very unsatisfactory; but in the treatment of gonococcal vulvo-vaginitis in children by this means, the results have been very favorable. This tends to show that the vaccine treatment will probably play an important rôle

in the future in the treatment of all cases, after the preparation and use of the vaccines have been more carefully worked out.

Some authors have noted a slight result in acute urethritis in the male, but better results in epididymitis, in prostatitis and salpingitis. The best results have been obtained in vulvo-vaginitis and gonococcal arthritis in children.

Hans Reiter, at the present writing, reports good results in the treatment of gonococcal arthritis with a vaccine of his own preparation, which will very shortly be placed within the reach of the practitioners in this country.

## SYSTEMIC GONOCOCCAL INFECTIONS

Systemic gonococcal infections are also of importance.

**Septicemia and pyemia** have occurred in a number of cases in which gonococcal infection was present and in which the gonococci were found in the blood. This condition has been noticed as early as the first week of the primary infection.

**Gonococcal endocarditis** may occur independently of any other complication. Thayer analyzed eleven cases in Osler's service at Johns Hopkins, in six of which gonococci were found in blood cultures and in two others in cover-slip preparations.

**Gonococcal myocarditis** has also been observed.

**Gonococcal arthritis** is one of the most serious complications. It is less frequent in females than in males, and it is fairly common in children with vulvo-vaginitis.

It generally occurs during the acute stage, although it is also common in the chronic stage. About two thirds of the cases are polyarticular. The joints most frequently involved are the sterno-clavicular, sacro-iliac, intervertebral and temporo-maxillary articulation. In the joints the gonococcus may be found alone or in combination with any other infection. The following varieties are recognized by Osler:

(*a*) Arthralgic, where there is no redness or swelling, but the patient complains of inconstant pains about the joints.

(*b*) Polyarthritic, where two or more joints are involved. In the acute stage they are red and swollen. Febrile symptoms are present.

(*c*) Acute gonorrheal arthritis, when in but one joint, becomes the seat of an acute inflammation, which is marked by much swelling, redness and pain, together with a low grade of fever.

(*d*) Chronic hydrarthrosis. One joint is usually involved. The knee joint is the seat of predilection. There may be no pain, redness or swelling.

(*e*) Bursal and synovial form. The articulations may not be involved, only the bursæ, tendon sheaths and periosteum. The sites of predilection are the patella, tendon Achilles and olecranon.

(*f*) Septicemic. This form of arthritis is associated with septico-pyemic symptoms and often with acute endocarditis.

(*g*) The painful heel of gonorrhea. This is due to a periostitis and exostosis of the os calcis.

Arthritis also occurs in the newborn and may be very grave if it goes on to suppuration, but in older children, it is usually subacute, mild and less prolonged than in adults, and does not terminate in ankylosis.

Patients generally recover from this trouble, although it sometimes requires months and years. They may be disabled, however, in a measure through having an ankylosed joint or some other resulting lesion.

**Treatment.**—The treatment is that of the local condition; application to the joint of ichthyol fifty per cent, massage every other day, wearing of an elastic woven cylinder to exert pressure on the exudate and to steady the joint; urinary antiseptics internally, the best of which is oil of wintergreen, five to ten minims three times a day; in the convalescence tonics of iron and arsenic, a generous diet, with as much exercise as possible in the open air in case there is no fever, also surf bathing. Syrup of the iodid of iron is a valuable remedy.

Treatment by means of gonococcal vaccines and serums has been used of late, and the former has given good results, as has been seen under Treatment of Children. The serum which at first promised the most brilliant results has now been discontinued.

# CHAPTER LXIV

## DISEASES AND INJURIES OF THE PENIS

### ABNORMALITIES

**Absence of the Penis.**—Absence of the penis is rare. Vinogrodoff reported the case of a boy seven years of age in whom there was no penis, although the scrotum and the testes were normal. In some cases, neither the scrotum nor the penis was present.

**Rudimentary Penis.**—Instances of this abnormality are often seen. Dr. Joseph Jones of New Orleans reported a case in which the organ was but an inch in length, the testicles and scrotum being absent. I had a similar case as far as the organ was concerned, although the testes and the scrotum were both correspondingly undersized. These cases were in adults.

**Concealed Penis.**—This is occasionally observed in infants, either beneath the skin folds of a cleft scrotum, or buried beneath the fat of the mons veneris. In these cases careful examination will reveal it as a small firm body.

The operation consists in an incision made through the overlying tissues, thus liberating the organ; flaps sufficient to cover it are taken from the adjoining skin. In cases of elephantiasis of the scrotum or in large hernias, the penis may be buried in the mass so that the urine flows through a sinus for some distance after leaving the urethra.

**Multiple Penis.**—Cases of multiple penis are rare. The organs may be situated either beside one another, over one another, or separated from one another. The functions of urination and copulation are generally intact. Dr. Templeton, at a meeting of the Northwest London Clinical Society, November 18, 1896, showed a healthy boy who had two separate organs, both with complete hypospadias. Though the symphysis pubis was normal, urine dribbled from a cleft beneath the pubic arch. The ureters were seen to open close behind the orifice. The testes had descended, and were contained in folds of skin at the side of the cleft. The case reported by Ernest Hart (*Lancet*, 1866) was a very interesting one. A strong healthy man had a withered thigh, leg and foot between his thighs. In front of this on either side were testes and a penis, all of which organs were functionating perfectly.

**Imperfect or Deformed Penis.**—The two principal varieties of imperfect or deformed penis are those connected with hermaphrodism and hypo- and epi-

spadias. True hermaphrodism, that is, when one side has the male germinal gland (the testicle) and the other the ovary, is rarely, if ever, seen; whereas the cases which come principally to our notice are of the spurious variety and very puzzling at birth, in that the organs belonging to both sexes seem to be present. In these spurious cases, a male with a cleft scrotum, undescended testicles and a diminutive hypospadic organ with the urethral opening in the perineum, closely resembles a female with an elongated clitoris and atresia of the vagina.

The following cases, one of true and the other of pseudo-hermaphrodism, illustrate the characteristics of the two conditions:

Case of Lukomsky (*True Hermaphrodism*).—Patient thirty years of age, had a penis two inches long without urethra, below which was a scrotum with two testes. Below the scrotum was a normal vulva, with labia majora, minora and clitoris, beneath which was discovered the urethral opening. The vagina was about three inches in length, with a normal uterus and cervix. The patient had never menstruated. In having coitus with a female, a whitish fluid was ejaculated through the vaginal slit.

Boudareff's Case (*Pseudo-Hermaphrodism*).—Patient thirty-five years of age, had a genital slit about one and one fourth inches long. The labia majora contained oval bodies resembling testicles, with spermatic cord running from them into the pelvis. The labia minora were small, resembling the continuation of the prepuce of clitoris. The clitoris was two and a half inches long, and two inches in circumference. It contained no urethra. The urethral orifice, through which the patient probably had intercourse, was at the upper angle of the vaginal opening and admitted two fingers. The vagina was shallow, measuring a little over an inch, and ending in a rudimentary uterus. Patient had never menstruated.

Conclusions.—From the numerous cases of true and pseudo-hermaphrodism, quoted by different authors, certain conclusions may be drawn:

1. That the greater part of these are cases of hypospadic males.

2. That the predominating sex should be carefully searched for and decided upon by physiological, as well as anatomical observations, but in so doing, the two principal signs to be considered are the presence of menstrual fluid, or a discharge from some point of a whitish fluid, containing spermatozoa.

3. That too much importance should not be attached in adult life to their male or female characteristics and sexual affinities, as these are governed to a great extent by the sex according to which they were brought up.

Treatment.—Careful examination having been made and the predominating sex decided upon, surgical interference should at once be instituted to correct if possible by a plastic operation the existing state of affairs, and to favor the healthy development of the parts by freeing them from any tissue tending

to induce the deformity by its interference. The operation also serves to cover over or remove any crevices, useless protrusions or hollows which are of no other use than to disguise or deform the true sex. In some cases, when it is uncertain which function will predominate, it is better to wait and perform simple temporary operations until further developments take place.

Congenital malformation and defects of the sexual organs are generally accompanied by imbecility, idiocy and epilepsy. Bourneville and Sollier, from a careful study of a large number of these cases, reported that of 223 under thirteen years of age, 164 were idiots, while 59 were idiotic and epileptic as well. Of 505 cases over thirteen years of age, 172 were idiotic and 333 were afflicted with epilepsy. The cases were principally those of hypospadias, atrophy of the testicles, ectopy of the testicles, and bell-clapper glans.

**Congenital Blind Pouches.**—Congenital blind pouches in the outer coverings of the penis are found in some subjects, especially in the sulcus of the corona, within the lips of the external meatus and in the margin of the prepuce close to the raphé. They are especially interesting, as they may become inflamed in gonorrhea and form one of the numerous complications which, although not serious, may exist for a long time.

In some instances, these pouches near the sulcus are elongated into narrow pockets, but they very rarely extend as far as the urethral canal, so that they do not become fistulæ in the presence of inflammation. Some of the blind pouches that show themselves as small folds of mucous membrane at the upper, the lateral or inferior aspect of the external meatus may be infected with gonococci and thus become of interest as lodging places for these germs. A few drops of gonococcal pus may frequently be pressed out of these pouches or canals and they are thus sometimes the cause of an infection or of an auto-infection.

Treatment.—The larger of these pouches may be treated by irrigation with the ordinary injection fluids, but usually they must be injected with a small urethral syringe with a fine nozzle or else with a hypodermic syringe and a dull needle. Silver-nitrate solution from 1:100 to 1:10 in strength should be used. For the healing of these paraurethral passages, applications of strong solutions of silver nitrate on a jeweler's broach with a thin film of cotton over it are frequently necessary, as it requires a much finer instrument to enter these sinuses than any that we have in surgery.

Electrolysis by the negative pole of a galvanic battery must be used in some instances, the application being made with the aid of a needle attached to the negative electrode. The simplest method of treatment which is indorsed by most surgeons is the slitting up of the paraurethral pouches by means of a fine scalpel. It is sometimes very difficult to slit these sinuses on account of their small size; whereas in other cases the extent of the slit through the glans involves the cutting of too much tissue.

When these little sinuses occur in the margin of the prepuce, they are the result of suppurating preputial follicles. They are manifested by a little opening at the edge of the prepuce through which some pus may be made to exude by pressure. This opening leads to a small sinus half an inch to one inch long, or to a nodule or abscess cavity which may be felt between the two layers of the prepuce. Long tight prepuces predispose to these lesions. The treatment for this condition is circumcision.

## INJURIES TO THE PENIS

**Wounds of the Penis.**—The classification is the same as for wounds of other parts.

(1) Incised wounds are generally made with a knife or razor by jealous women, or by monomaniacs for the purpose of self-mutilation. They are often irregular on account of the tough, trabecular nature of the tissue of the corpora cavernosa and the extreme mobility of the organ.

(2) Punctured wounds are rare, except in time of war, when they are caused by sword and bayonet thrusts. They also occur during fights and brawls.

(3) Lacerated wounds are not common; they are most often due to the organ having caught in machinery. Gunshot wounds also produce them, and one case of this kind came to my notice, while in East Africa, in the case of a British officer who had been wounded during the Boer War. A part or the whole organ may be destroyed in this way.

In these conditions, open wounds of the urethra frequently occur. The incised and punctured wounds of the canal have already been considered under Injuries of the Urethra.

(4) Contused wounds are caused by falls, blows, kicks, jams and similar accidents. They are often serious and are liable to be complicated by fracture or laceration of the organ, as well as by rupture of the urethra. The urethral injuries have been considered at length in the chapter on this subject.

(5) Strangulation of the penis is generally classified with this condition. It has been observed in boys suffering from incontinence of urine or seminal emissions, who tied a string around the organ as a preventive. If the resulting strangulation is not relieved, the string may cut through the urethra and slough of the organ may result. Oftentimes after the string has been removed, a band of ulceration results, which may give rise to a cicatrix, interfering with the function of the organ. It will thus be seen that not only may faulty erections follow, distal to the seat of the injury, but also traumatic stricture or fistulas of the urethra. Strangulation may result from other causes. Potts reported the case of a man who came to him with his organ greatly swollen and discolored, the glans being quite black. About two thirds back on the organ

was a ring deeply imbedded, which had been slipped over it by a woman a few hours before. This was filed off by passing a grooved director beneath it.

A peculiar case was observed at the Chambers Street Hospital some years ago. A young man had put his organ in a bottle. Strangulation ensued and he entered the hospital some hours afterwards, wearing the bottle. The part of the penis within the bottle was very much swollen and congested and the organ was liberated with great difficulty.

TREATMENT.—The dangers to be guarded against are hemorrhage or urinary infiltration due to injury of the urethra; curvature, and incomplete or complete loss of erectile power distal to the injury, as the result of a wound of the corpora cavernosa. In case the corpora cavernosa are wounded on but one side, erection may be absent on that side. In all open wounds, wash, cleanse and thoroughly remove any débris. Ligate severed vessels, approximate and sew up incised wounds in the fibrous sheath of the corpora cavernosa with silk or chromic gut. If the urethra is cut, its edges should be brought together and united with chromic gut and a catheter retained. The subject of urinary infiltration is treated under Injuries of the Urethra. From all these wounds, cicatrices causing curvature, as in cases of fracture, may occur, the curve depending on the site of the wound.

**Fracture of the Penis.**—This is generally due to injuries received when the organ is in a state of erection, by "missing the mark," as Bryant termed it, when in coitus the organ strikes the outer wall of the vulva or the pubes; or it may occur in relieving a chordee by a blow—"breaking the chordee," as it is termed. In this manner, a traumatic stricture may be caused in case the urethra is injured. Fracture of the penis is followed by pain, swelling and induration in one or both of the corpora cavernosa. Later, an atrophied condition occurs at this point, which interferes with a complete turgescence of that side and may result in lateral curvature.

I have seen but one case of fracture of the penis. It occurred in the case of a Cuban physician during intercourse. He is still under observation and gradually recovering his power of erection on the injured side.

Fracture of the penis may be complicated by rupture of the urethra, in which case there is often an abundant urethral hemorrhage and sometimes extravasation of urine. Fracture of the corpus spongiosum may occur as well, though this is rare. Bryant mentions the case of a boy nineteen years of age, who was bitten by a horse, entirely severing the spongiosum, which prolapsed from the urethra as a fleshy mass. This was of no especial inconvenience, the urine escaping by its side.

TREATMENT.—Rest in bed should be enforced, and cold applications should be employed locally or a wet dressing of lead-and-opium wash; a soft-rubber catheter is to be passed and retained. If edema and swelling are great and slough threatens, a longitudinal incision should be made of sufficient length to

evacuate blood clots or other causes of pressure, after which a wet antiseptic dressing should be employed. The organ should be kept elevated. For the treatment of urethral injuries, see section on the Urethra.

**Dislocation of the Penis.**—Malinowski reports a case in an adult in which the penis was dislocated into the scrotum by mechanical means and remained there for four months. It was then liberated and reclad with its own integument, patched out with scrotal tissue. The power of coitus quickly returned. J. B. Field reports a case in which the penis and both testicles were dislocated under the abdominal integument above Poupart's ligament.

A. B. Hill reported the case of a boy who was caught in a hay rake, lacerating his scrotum and dislocating his penis upward under the abdominal integument. This was not discovered until retention of urine set in. The tissues were then split up and the organ drawn down into place.

## CUTANEOUS AFFECTIONS

Cutaneous affections of the penis may be classified as acute and chronic. The acute embrace eczema, erysipelas, scabies and herpes; the chronic include lupus, tuberculosis, epithelioma and verruca. Of these herpes, epithelioma and verruca will be considered elsewhere. There are other affections, acute and chronic, which, though involving the skin, will for the sake of classification be considered later, as lymphangitis, adenoma and elephantiasis.

**Eczema.**—Eczema of the penis may be either of the erythematous or vesicular form. When the scrotum and penis are both affected, it is apt to be chronic and very rebellious, and may be accompanied by phimosis and enlargement of the inguinal glands. Eczema is found in men between the ages of thirty and fifty who are of a catarrhal, gouty or rheumatic diathesis. Its favorite seats are the prepuce near the margin and the base of the organ. Eczema of the prepuce is generally subacute and occasioned by the organ rubbing against the underclothing or other ill-fitting garments. When accompanied by an inflamed and infiltrated base and enlarged glands in the groin, it often causes considerable anxiety to the patient, especially if it occurs soon after a suspicious coitus, as he is very apt to fear that he has the initial lesion of lues. Eczema may also appear on the inner layer of the prepuce. Eczema of the base of the penis is generally chronic and slightly infiltrated. It may cause very little inconvenience for months or years.

Treatment.—The *acute* variety is best treated with powders. The patient should be directed to wash the surface twice a day with warm water, and afterwards to sprinkle on a powder consisting of boracic acid ʒj, bismuth ʒij and lycopodium ʒiij. In some cases, after sprinkling with the powder, I lay over it a soft piece of sheet lint covered with vaselin. Eczema in this location, as elsewhere, is often due to faulty excretion of the kidneys or an accumulation

of excrementitious matters in the blood in individuals of a gouty or rheumatic diathesis. Considerable assistance may be derived from the use of acetate or citrate of potash grs. xv in a glass of water between meals. The enlarged inguinal glands disappear with the improvement of the eczema.

In the *chronic* variety, such as occurs about the base of the penis, ointments seem to be the most efficacious, and it is necessary in these cases to resort to mild stimulation. Good results are often obtained by adding one to two drachms of oil of cade to the ounce of zinc oxid, Lassar or diachylon ointment. If much moisture exists, the dusting powder above mentioned should be used together with pledgets of absorbent cotton.

**Scabies.**—Scabies is the cutaneous affection which causes perhaps more alarm than any other acute nonvenereal lesion found on the penis. The lesions may be either papular, vesicular or pustular. A patient with one or two papules on the organ, enlarged glands in the groin and an eruption on the body may believe that he has syphilis, especially if he happens to have a sore throat, a cold, or malaria at the same time. Careful examination, however, would at once show the difference. The eruption of scabies itches and is acute and irritable. The presence of burrows is an important diagnostic sign; the most typical of these are found on the penis and between the fingers. The lesions of this disease on the penis at times resemble moist mucous patches, for which they are often mistaken.

TREATMENT.—Wash with soap and water and apply the following ointment:

| | | |
|---|---|---|
| ℞ | Acid. carbolic | grs. x; |
| | Ol. cadini | ʒss; |
| | Ung. sulph. | ℥j. |

Scabies of the rest of the body should be treated in the same way every night for five nights, and the patient should be directed to put on clean underclothes every morning.

Small suppurative sinuses and inflamed follicles with minute openings usually directed toward the glans may be seen on the under surface of the penis. These are generally inflamed sebaceous or hair follicles, but may also be small periurethral abscesses. The treatment of these suppurative follicles is incision, thorough scraping with a small curette and cauterization.

**Lupus.**—Lupus of the penis is a rare affection. The erythematous variety is differentiated from epithelioma, with which it is very often confounded, by the duration and slowness of the disease, the characteristic scaling and the presence of cicatricial tissue in the places which have already been invaded. Lupus vulgaris differs also in duration, being a disease beginning during boyhood or youth, whereas epithelioma begins in old age, advances more rapidly, tending to glandular involvement and ulceration.

**Tuberculosis of the Penis.**—This is an exceedingly rare disease. Tuberculous-looking ulcers may appear on the glans, in the urethra and extend to the periurethral tissues or in the corpora cavernosa. The involvement of the corpora cavernosa and other periurethral tissues gives the organ an enlarged irregular appearance. It has a nodular or irregular outer surface and looks white and lardaceous. It is hard in some places and edematous in others; the change is more marked in the substance of the organ. I am describing what I consider tuberculosis of the penis existing in the urethra, the corpus spongiosum and corpora cavernosa rather than a skin affection, which latter resembles a verrucal form of lupus. I have never been able to prove that my suspected cases were tuberculosis, although the history pointed to it, as they unfortunately disappeared from view. I have seen but three cases.

## LYMPHATIC AND SUPPURATIVE AFFECTIONS OF THE PENIS

The various lymphatic and suppurative inflammations, lymphangitis, abscesses, phlegmon, erysipelas, are closely allied, in that the infecting material is introduced through the lymphatic channels and the inflammation begins around them or else the suppuration extends directly from the urethra.

**Lymphangitis.**—In one variety of lymphangitis, a hard cord appears on the dorsum of the organ during an acute gonococcal inflammation. This rapidly becomes reddened, painful and tender, and is usually followed by enlargement of the inguinal glands. In extremely rare cases, the lymphatics of the dorsum break down and suppurate, forming one or more abscesses (as is seen in Fig. 823), complicating subpreputial chancroids.

Fig. 823.—Dorsal Lymphangitis Broken Down in Areas. (Author's case.)

There is another form of lymphangitis in which the lymphatics on the side of the penis become very much enlarged and often the whole organ is swollen, red and inflamed. When the lymphatic inflammation becomes so great that suppuration takes place and no incision is made, the pus is often discharged through the prepuce, coming out from its inner side.

Still another variety of lymphangitis, known as virulent lymphangitis, occurs generally in connection with chancroids, in which case the virus sets up an

inflammation in the lymphatics of the penis before they reach their terminal ganglia. Lymphangitis also accompanies venereal warts associated with balanoposthitis and phimosis.

TREATMENT.—Lymphangitis of the penis should be treated during the acute stage with lead-and-opium wash, a wet dressing of carbolic 1 : 100, or bichlorid 1 : 10,000 and elevation of the organ. If cellulitis threatens, poultice, open and treat as cellulitis elsewhere. In cases of lymphangitis with virulent abscesses, open and treat as buboes.

**Abscess of the Penis.**—Abscess may develop as elsewhere on the body with no apparent cause. I remember the case of an Italian at the clinic, having on the left side of his organ an abscess two inches in its longest diameter. The man was otherwise in perfect health and not suffering from any venereal disease. This was probably due to infection of a skin follicle. They are generally due to a stricture or to a periurethral inflammation resulting from an inflamed urethral gland, the duct of which had become occluded. There are many causes of abscess, such as infection of the skin and subcutaneous tissues in scabies, verrucæ, gonorrhea, inflamed hair follicles, or the bites of insects.

TREATMENT.—A poultice should be applied until fluctuation has taken place, when the abscess should be incised and drained as in the case of an abscess elsewhere.

**Cellular Inflammation of the Organ or Penitis.**—This is of rare occurrence, and usually complicates a gonorrhea, or one of the conditions just mentioned. It is more diffuse and occupies the lower part of the organ, which is much swollen, reddened and infiltrated with more or less marked fluctuation. There may be considerable elevation of temperature. It is very similar to lymphangitis.

FIG. 824.—GANGRENE OF PREPUCE. (From Taylor.)

TREATMENT.—The treatment consists of tonics, such as quinin, iron and strychnin, and, locally, poultices. When fluctuation takes place, it should be opened and drained.

**Gangrene of the Penis.**—Gangrene is a rare condition. Extensive gangrene is caused by mechanical pressure, such as ligatures, rings or other constricting bodies placed about the organ, and occurs also in urinary extravasations following a periurethritis or an injury to the urethra. Gangrene of the prepuce occurs in cases of phimosis due to subpreputial lesions or growths, such as chancres or chancroids, warts or epithelioma. In these cases,

there is first redness and swelling of that portion of the organ, followed by a dusky color and by diminished sensibility. A line of demarcation then forms and a sulcus behind this through which urine escapes in case the urethra is involved (Fig. 824).

TREATMENT.—Charcoal poultices are employed until the slough is thrown off, after which the disease is treated with a dry dressing of iodoform and charcoal (1:2). Besides this, good diet, strychnin and other tissue builders should be prescribed. The systemic conditions predisposing to the gangrene are diabetes, tuberculosis, nephritis, alcoholism, syphilis and chronic malaria, all of which should be examined for, and if one is found, it should be treated.

## TUMORS OF THE PENIS

Tumors of the penis may be either of the malignant or nonmalignant type.

### BENIGN TUMORS

The nonmalignant tumors are cysts (mucous or sebaceous), adenomata, fibroids, vascular growths and elephantiasis.

**Mucous Cystic Tumors.**—Mucous cystic tumors are rare. They may occur anywhere on the balano-preputial mucous membrane.

Sebaceous cysts may occur in any region in which sebaceous glands are present (Fig. 825). They have a lardaceous appearance. They should be treated like wens in other localities.

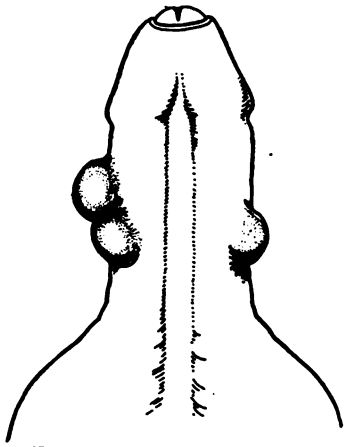


FIG. 825.—SEBACEOUS CYSTS. (Author's case.)

**Vascular Tumors.**—Vascular tumors are of three kinds: Capillary or nevi, venous or angiomata and arterial or erectile. Of these, the most common variety is the venous or varices, found on the dorsum, consisting of large soft masses of tortuous veins. They have been reported of such a size as to interfere with the proper erection of the organ. They are very rare and up to date I have never seen one.

Capillary and arterial tumors are exceedingly rare.

TREATMENT.—Excision, cauterization and electrolysis are employed by some operators. Parona reports three cases of varix of the dorsal vein cured by injections of half a gram of saturated solution of chloral hydrate.

**Fibroid Tumors.**—They usually occur upon the body of the penis, either on the side or on the dorsum. They are probably due to a plastic effusion into

the trabecular structure of the corpora cavernosa, and a fibroid development as a result.

Marcus Beck reports the case of a man fifty-three years of age, healthy and robust, who had on the left side of the organ, below the glans, a tumor about the size of a hen's egg, irregular and nodular in shape. Its base almost surrounded it. It was very hard and free from pain. The lower part of the tumor was in an ulcerated condition. Thirteen years before a warty growth was discovered on the inner side of the prepuce near the base of the glans. In two years this had reached the size of a walnut. Circumcision was then performed, removing the growth. Two years later a tumor developed in the cicatrix. This grew slowly until six months ago, when it began to develop rapidly, interfering with coitus, though not with micturition. Amputation of the organ was performed. The growth was found to be continuous with the corpus spongiosum and the corpora cavernosa, evidently arising from the latter. Microscopically it showed a delicate white fibrous structure.

**Elephantiasis.**—Elephantiasis may occur alone, but it is generally associated with that of the scrotum. In the latter case, the organ may assume a large size, or it may become completely hidden in the enlarged scrotum, only a small hole remaining for urinating. After an operation, however, the penis recovers its former activity. I have seen but one case, that of R. W. Taylor of New York City. It occurred in the prepuce of an old soldier as a result of a former wound of the lymphatics on the dorsum of the organ near its base, received in war. The growth of the prepuce progressed slowly, and when the patient presented himself, was about the size of a duck's egg. Circumcision was performed, giving very good results, the integument of the body of the penis being very slightly involved.

**Adenoma.**—Adenoma is rare, the following being the only case which has ever come under my observation:

Man, thirty-four years of age. No venereal history other than that of urethritis eighteen years ago. Two years previous, he had noticed that his prepuce was swollen and edematous. The inflamed condition became gradually less diffuse and more nodular. The skin of the prepuce and body of the organ contained several subcutaneous tumors, varying from the size of a pea to a marble which on removal were reported to be adenomas.

**Horny Growths.**—Horny growths are comparatively rare. An interesting case was reported by J. H. Brinton in the *Medical News*, concerning a farmer sixty-two years of age. The horny growth sprang from the base of the glans and body of the organ. It was one and seven eighths inches in length, and one and three eighths in circumference at its base. There was also a plate of horny tissue encircling the end of the glans penis, which surrounded and narrowed the meatus. There was no frenum. The horn was striated, like an exaggerated thumb nail and, when dry, was of smooth polished appearance. A very in-

teresting case of the same kind was brought to the clinic by Dr. C. R. O'Crowley of Newark, the history of which is as follows:

The patient was fifty-three years of age. Nine years ago, the growth started like a fish scale in the coronary sulcus, and gradually increased in size. It never bled, although the patient used to trim it with a knife after softening it in water. The horn was one and three quarter inches long, five eighths of an inch in diameter at its base, diminishing in size toward its apex. It was freely movable and not attached to the deeper tissues. It was removed very easily by blunt dissection and the base cauterized with the actual cautery, which resulted in a simple sloughing ulcer. This was healed by a dry dressing of aristol (Fig. 826).

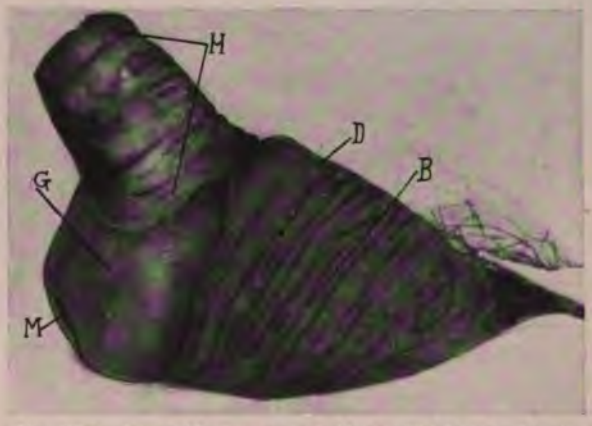



Fig. 826.—Horn Growing from Glans 1¾ Inches Long. (Author's clinic case.)

## Malignant Tumors

Cancer and sarcoma are the most common.

**Scirrhous Cancer.**—Scirrhous cancer occasionally occurs, but is very rare; the more common form is epithelioma.

**Epithelioma.**—Epithelioma of the penis usually develops as a warty growth, closely resembling ordinary venereal warts (verrucæ). It is most frequently situated on the inner side of the prepuce near its margin or near the sulcus. The growth causes very little pain or annoyance, as it is at first superficial and grows slowly. Soon, however, sufficient infiltration occurs to make the retracting of the prepuce difficult, and finally complete or partial phimosis exists; yet the patient has no disagreeable symptoms, except perhaps a few vague pains or an uncomfortable feeling in this locality. A little later, however, an offensive ichorous discharge takes place from beneath the prepuce, and painful erections may occur at night, followed by a bloody tinge to the discharge. An area of induration can then be felt beneath the prepuce. The disease occurs in men of middle or past middle age, perhaps cachectic, but often strong and robust. The inguinal glands may or may not be enlarged. The epithelioma grows slowly, involves the lymphatics gradually and infects the general system still more slowly. In the further progress of the case, ulceration takes place, the lymphatics become infiltrated and enlarged glands appear

in the groin (Fig. 827). If the growth is examined microscopically, it will be found to consist of epithelial cells flattened and crowded together, situated in the interstices of a network of fibrous tissue, with a tendency to arrange themselves in nests.

FIG. 827.—ULCERATING EPITHELIUM. (From White and Martin.)

TREATMENT. — The operative procedure depends very much upon the stage of development the tumor has reached when the patient first seeks advice. There are four operations to choose between, depending upon the situation, duration and development of complications of the disease. They are circumcision, curetting, excision and amputation. There is no disease of this organ where the variety of operations depends so much on the surgeon's individual judgment as it does in this one. If the lesion is situated on the prepuce near its margin, of short duration and without complications of the lymphatics, circumcision should be performed. If situated near the balano-preputial fold, on either the prepuce or the glans and uncomplicated, it may be either curetted or excised. A good method is first to curette and thoroughly cauterize the base; then if there be a recurrence, excise it. If, after this, a return takes place, amputate. If ulceration has begun and is at all extensive, amputate immediately.

A question arises as to the importance to be attached to glandular enlargements. Almost any lesion of the organ in an irritated condition may give rise to enlarged inguinal glands. The enlarged glands in a case of this kind may be due to irritation or inflammation, or, on the other hand, to direct cancerous infiltration. If due to the first, they will subside after removal of the growth. If due to cancerous infiltration, they should be removed at the same operation.

In performing this operation on the pendulous portion of the penis, the principal difficulties are hemorrhage, retraction of the orifice of the divided urethra within the stump, the narrowing of the orifice by the contraction of the superficial tissue and the wetting of the wound by the urine.

The operation that I have been teaching for the last eighteen years at the

Post-Graduate, and which I have modified from time to time, has been formulated with the object of overcoming these difficulties.

*Technique of Operation.*—An elastic band, often a catheter, is tied about the base of the organ and a circular incision made through the integument at a point above the growth where it is healthy. The integument is then dissected down for three quarters of an inch and rolled back as a collar toward the pubes. A sound, No. 20 French, is passed through the canal and held at right angles to the body. The blade of a straight bistoury is inserted on the side of the organ at the point to which the flap has been rolled back, having the cutting edge pointing toward the glans. The blade is then worked in between the urethra and the corpora cavernosa until it comes out at the corresponding point on the other side. It is turned toward the corpora cavernosa and is made to cut through them. The amputated portion of the cavernous bodies is then taken between the fingers of the left hand, and traction is made upon them, while they are dissected from the urethra for a distance of half an inch (Fig. 828). The bistoury is then turned toward the urethra, the sound is withdrawn and the urethral portion is amputated at a point half an inch above the reflected flap. Thus we will see that the operation, as far as it has advanced, consists of an amputation performed in such a way that the urethra extends half an inch beyond the corpora cavernosa, and the integument three quarters of an inch beyond it. The two dorsal arteries and veins and the two arteries of the corpora cavernosa are then caught and ligated with fine catgut, also the small artery of the septum, if present, and any oozing is controlled by peroxid of hydrogen, hot water and pressure.

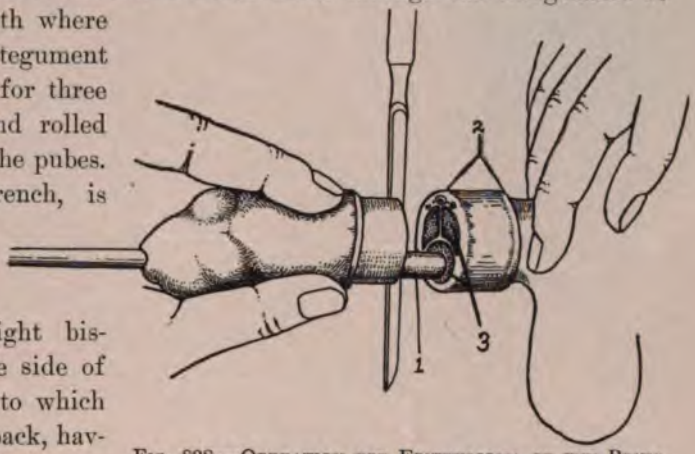



FIG. 828.—OPERATION FOR EPITHELIOMA OF THE PENIS. (1) Shows the urethra being freed prior to cutting through it, (2) the reflected skin flap, and (3) the penile tissue cut through.

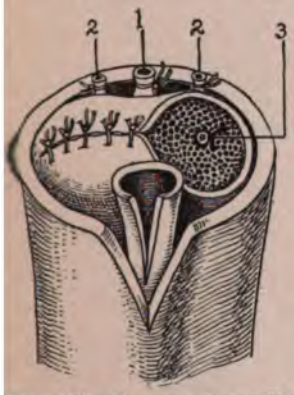



FIG. 829.—OPERATION FOR EPITHELIOMA OF THE PENIS. Shows the tunica albuginea of the right corpus cavernosum united transversely and the left corpus cavernosum not yet covered; the dorsal vessels, 1–2, and that of the left corpus cavernosum, 3, to be ligated. The urethra and skin are seen to be split for half an inch on the lower surface.

The upper and lower edges of the tunica albuginea of each of the corpora cavernosa are approximated and united transversely by interrupted sutures (Fig. 829).

The skin and urethra are split for half an inch in the median line of the lower surface of the stump. The skin is then brought over the end of the stump and united by interrupted sutures, the edge of the urethra making a triangular appearing opening with less tendency to contract than when they are united without splitting the flaps (Fig. 830). A retained catheter is passed through the canal and retained, as already shown under Urethral Instrumentation. The wound is then dressed with an aristol dry dressing. The inguinal glands should also be extirpated when they can be felt. The results have been very favorable and, after the operation, the organ appears normal and in a state of phimosis.

Fig. 830.—Operation for Epithelioma of the Penis. The skin pulled over the stump of the corpora cavernosa is united to the upper urethral wall transversely, and the split edges of the skin and urethra are united on each side, making a new meatus with a triangular opening.

The operation of perineal amputation or extirpation of the penis is performed in cases in which the organ has been extensively destroyed by the disease. I will quote the operation from Keen's "Surgery," as described by Dr. Orville Horwitz:

"If there is glandular involvement, the glands are first removed, after the following manner, suggested by Curtis. An incision is begun on one side, parallel to Poupart's ligament, and continued across the pubic bone to the groin of the opposite side. An upper and lower skin flap are dissected a little distance beyond the diseased glands. The incision is then carried downward until the fascia of the external oblique is reached, after which the entire mass of fat and glands is dissected free from the abdominal fascia until Poupart's ligament is reached. The same procedure is instituted below as was carried out above. Beginning below the mass and working upward, the fat and glands are dissected free from Scarpa's space. The upper and lower dissections are continued until they meet at Poupart's ligament. The opposite groin having been treated in a similar manner, the surgeon proceeds to extirpate the organ.

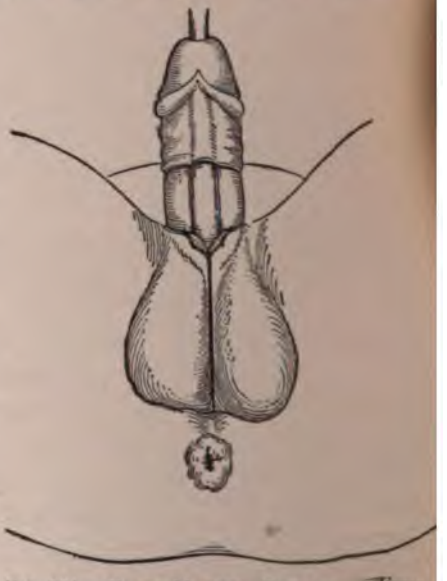


Fig. 831.—Flaps Marked Out for Extirpation of the Penis.

"The patient is placed in the perineal lithotomy position. A steel bougie is inserted into the urethra. An incision is made along the raphé of the scrotum from the root of the penis down

to the perineum [Fig. 831]. By the aid of scissors and blunt dissection the scrotum is divided in the middle line, separating the vaginal tunics, each containing a testicle, which is held aside until the corpus spongiosum is freely ex-

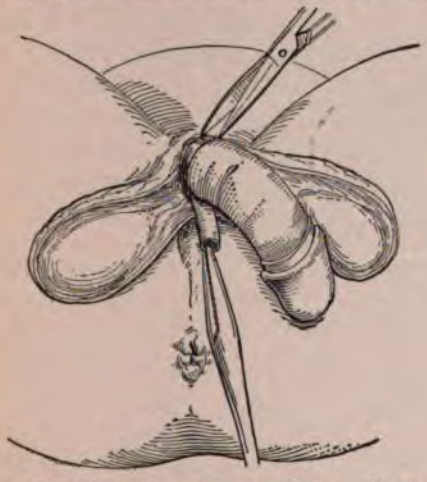


FIG. 832.—EXTIRPATION OF THE PENIS. Showing the scrotum separated, the urethra cut through, and a circular incision around the root of the organ down to its fibrous sheath.

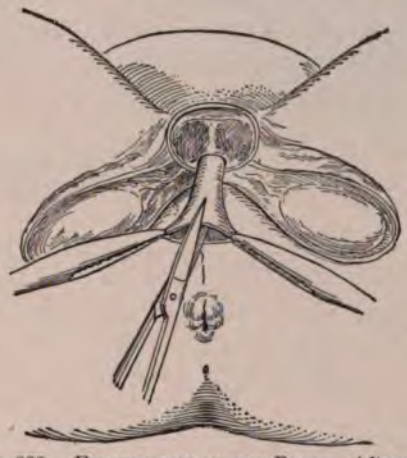


FIG. 833.—EXTIRPATION OF THE PENIS. After the penis is removed the divided urethra makes better union with the skin.

posed at the bottom of the wound. The corpus spongiosum is next dissected free from its attachment to the cavernous bodies. The urethra is freed, if necessary, as far back as the anterior leaflet of the triangular ligament. The bougie is removed, and the urethra cut across and placed to one side until the succeeding steps of the operation are completed. A circular incision that completely surrounds the root of the penis and divides the skin down to the fibrous sheath of the penis is now made [Fig. 832].

"The skin flap is pushed back toward the pubes, the suspensory ligament divided and the cavernous bodies detached until only those of the crura remain, which are severed in turn. This procedure may be rendered bloodless by employing the angiotribe devised by Downes. All bleeding vessels being controlled, the detached penis, together with the mass of fat and glands that is still attached to the organ by a pedicle consisting of fat and lymphatic vessels, is removed *en masse*. The skin wound is closed by interrupted silkworm-

FIG. 834.—EXTIRPATION OF THE PENIS. The operation complete and a retained catheter placed.

gut sutures. The urethra is split in the median line for at least half an inch, and fastened to the skin surface as far anteriorly as possible [Fig. 833]. A soft-rubber catheter is inserted and allowed to remain until the sutures are removed on the seventh day [Fig. 834]. A light antiseptic dressing is applied."

**Sarcoma of the Penis.**—Sarcoma is rare and generally rapidly fatal. It may develop on the glans or corpora cavernosa.

TREATMENT.—Immediate operation.

## DISEASES OF THE GLANS AND LINING MEMBRANE OF THE PREPUCE

**Gonorrhea.**—An acute gonorrhea usually gives rise to some congestion or inflammation of the surface of the glans and is very frequently associated with edema of both the glans and the prepuce. This will be considered again under Balanitis.

**Herpes Progenitalis.**—Herpes progenitalis is a condition characterized by the appearance of one or more vesicles at some point along the balano-preputial membrane, the most frequent locality being the sulcus behind the corona. This is generally an ephemeral condition, and occasionally a recurring one.

ETIOLOGY.—Herpes generally occurs in men of a catarrhal diathesis, having a tendency to gout and rheumatism, or in neurotic individuals. The predisposing causes are a tight and badly fitting prepuce; some irritation along the genito-urinary tract, due to exacerbation of a localized inflammation; excessive venery, or contact with acid secretions, such as the menstrual discharge. The lesions may be simple, the vesicles appearing and drying up in a few days, or they may take on an ulcerated form, closely resembling beginning chancroids.

FIG. 835.—HERPES OF THE GLANS. (From White and Martin.)

*Simple herpes* appear as one or a cluster of vesicles, surrounded by a slight pink areola (Fig. 835). When they break, the surface left resembles that of a cold sore. When they coalesce, they do not lose their characteristic

outline, but unite in a polycyclic form. They are covered with a little serum, which when the lesion is near the skin, forms a yellow crust.

*Herpes zoster* may also occur in this region, as elsewhere. I remember having seen but one case.

*Neuralgic herpes* is closely allied to herpes zoster and occurs in persons subject to neuralgia. The attack is preceded and accompanied by itching, burning and painful neuralgic symptoms in the sciatic regions, in the penis, or throughout the whole genito-urinary tract. Painful micturition is a frequent accompaniment, and it is said that even strangury may occur.

*Ulcerating herpes* occurs generally in the cachectic, uncleanly, or in persons who have a prepuce so tight that the lesions are torn whenever it is retracted, thus keeping up a constant irritation. They are the most difficult to diagnosticate from chancroids, but are not of such a severe type and the Bacillus of Ducré is not present. They are also frequently situated behind the corona and occasionally have a punched-out appearance with round or oval clean-cut edges.

*Recurrent herpes* are often accompanied by balanitis. The lesions are generally situated in the sulcus, and as quickly as one or two are healed, others appear; they sometimes continue to recur for weeks. They are generally associated with a tight prepuce.

The TREATMENT will be considered under that of Balanitis.

FIG. 836.—CHANCROIDS. (After Nicolas.)

**Chancroid.**—Chancroid is an acute ulcerative process coming on a few days after coitus. The lesions are usually multiple. They have irregular edges and a sloughy purulent base (Fig. 836). Examination shows them to be tender to the touch. The base is not indurated. A large inflamed, inguinal adenitis frequently develops, which may break down and suppurate. The external appearance of the ulcerating surface of such a bubo sometimes resembles a chancroid so closely that it is called a chancroidal bubo. Chancroids are autoinoculable.

**Lues** (*Syphilis*).—Lues frequently develops on the organ and usually involves the glans or prepuce. The three principal forms are the initial lesion, the mucous patch and the tertiary—the gummatous and tubercular syphilides.

The INITIAL LESION of syphilis is usually single. It is in the form of either an erosion or an ulceration. It generally manifests itself three weeks

after exposure, but the histories of patients show it to first appear anywhere from two weeks to two months. A healed erosion is very often seen as a nodule. An erosion usually has a well-rounded edge and a smooth base of a pink or red color, covered by a clear white film. Its base is indurated (Fig. 837). When it occurs on the prepuce or behind the corona of the glans, the base is very much indurated; whereas when it occurs on the glans proper, the induration is not so marked. Sometimes there is simply a stiffening at the base—the so-called wafer chancre. The ulcerating lesion may occupy the same position as an erosion, but it is frequently found on the margin of the prepuce and sometimes is fissured, as this part is liable to considerable strain and stretching. The edges of the ulcerating lesion are also well rounded and the base red and bathed in pus, although the suppurating process is not as active as in a chancroid. Sometimes an initial lesion of the ulcerative type becomes phagedenic and destroys considerable tissue. This usually happens in diabetics, nephritics and alcoholics (Fig. 838). The lesions may be multiple, although I do not recall ever having seen more than three initial lesions in any one case, but there is no reason why there should not be as many as there are ports of entry for the virus. One of the reasons why chancroids are more multiple than initial lesions, is on account of their autoinoculability, and their tendency to extend.

Fig. 837.—Initial Lesions at Base of Organ. (From Taylor.)

Fig. 838.—Phagedenic Chancre in a Diabetic that has Eaten Through the Prepuce Showing the Glands.

The glands in the groin in lues are indurated and have a succulent feel as if freshly involved. They are about the size of a pea or bean. They do not usually form a mass or bubo, as do the glands in case of

chancroid. When a bubo does form, it is smaller and less inflamed than that of chancroid and does not break down unless there is mixed infection.

Mucous patches occur during the second stage of lues. They frequently accompany a papular eruption. They are usually slightly elevated and have a flat surface which is covered by macerated epithelia. Generally they are situated on the glans or on the corona; in the former case they have more of a macular appearance and but a slight thickening. Both an initial lesion and a mucous patch can be diagnosticated by examining the scrapings from their surface for the spirochete.

Tertiary lesions sometimes appear on the prepuce and may involve either the inner or the outer surface as well as the glans. If it is a *gummatous* process, it appears in the form of elevated round tubercles which break down, leaving scar tissue. Sometimes they destroy the tissue of the glans down to the urethra, causing a fistula, a condition of hypospadias or an irregular opening through the side of the glans. The *tubercular* tertiary lesions, of the dry form, usually are on the outer side of the prepuce and have the same appearance as elsewhere in the body. (See chapter on Lues.)

The treatment will be discussed under that of Balanitis.

**Acuminatæ.**—Etiology.—They generally occur in young adults who are uncleanly, those who are suffering from urethritis or in those whose balano-posthitic mucous membrane is unusually moist.

Fig. 839.—Verrucæ Forming Cauliflower Masses. (From Taylor.)

Venereal warts consists of an abnormal hypertrophy of the papillæ of the skin or mucous membrane with an increase in the connective tissue and vascular supply. They are either soft or hard, depending upon their seat. On mucous membranes they are soft, on the integument they are hard. The favorite seat for the moist variety is the balano-preputial membrane, especially the sulcus behind the corona. The hard warts usually occur on the integument between the scrotum and the thigh, or elsewhere. They may be single and pedunculated, or sessile and form cauliflower masses of large size (Fig. 839). These sometimes grow to such dimensions subpreputially as to cause not only phimosis, but also ulceration and sloughing of the prepuce, after which they may grow through the opening made by the slough. The glans itself sometimes also protrudes from this window in the prepuce. In color they vary from a pinkish white to a deep red. They secrete a pungent, viscid fluid, having a disgusting odor.

Diagnosis.—Verrucæ acuminatæ can be confounded only with the condylomata lata of syphilis and with epithelioma. Verrucæ acuminatæ develop

slowly and are longer and more slender than the condylomata lata, which are flat papules in a syphilitic subject, and later become roughened, moist and vegetating. Verrucæ differ from epitheliomata in that they appear in younger individuals and are of a much more rapid growth.

The TREATMENT of verrucæ will be considered under that of Balanitis.

**Balanitis, Posthitis and Balano-Posthitis.**—The balano-posthitic mucous membrane extends from the urethra with which it is continuous, to the margin of the prepuce, where it joins the skin of the penis covering its outer surface. It is drawn comparatively tight over the glans penis, is quite adherent to the tissues behind the corona and is then loosely reflected along the prepuce to which it acts as an inside lining. An inflammation of the part of the membrane covering the glans is called balanitis, whereas that of the part covering the preputial fold is called posthitis. When the inflammation affects the whole membrane, it is called balano-posthitis. It is most commonly found in persons having a badly fitting prepuce, too long or too tight, with a small orifice, or a short frenum.

The contributing causes are decomposing smegma and various subpreputial pathological conditions, such as gonorrhea, herpes, chancroids, chancres, verrucæ and malignant growths. The exciting causes are carelessness in cleansing the parts, thus allowing an overaccumulation and decomposition of smegma; too frequent coitus with women suffering from uterine troubles complicated with leucorrheal discharges, gonococcal pus or venereal ulcers situated in this locality. Incontinence of urine and diabetes, on account of the decomposition of the urine with which the parts are so frequently bathed, are also causes.

FIG. 840.—CASE OF SINGLE BALANITIS.
(From White and Martin.)

SIMPLE OR PRIMARY BALANITIS.—This is due usually to decomposing smegma or an excess in coitus. A burning, itching sensation and a feeling of heat and pain in the glans are the usual signs, sometimes pain with erections or on drawing back the prepuce. The surface of the glans presents a bright red or pinkish color, having a soft, moist, spongy appearance and covered in

places with a white creamy coating. When posthitis occurs as well, and more pressure exists, it has a more mottled appearance, due to the macerated epithelium, which is wanting in places. In this case, swelling and redness of the prepuce near the margin takes place. Sometimes the balanitis is complicated by a vesicular eruption, probably a form of herpes, over the glans, which gives rise to erosions when their rupture takes place (Fig. 840).

SECONDARY BALANITIS is due to the presence of herpes, verrucæ, epithelioma, gonorrhea, chancre or chancroids, both on account of their irritating discharges and the interference with the circulation caused by their pressure. Circumcised patients do not suffer from balanitis.

*Gonococcal balanitis* closely resembles the simple form. The posthitis is, however, marked and there is frequently considerable edema of the prepuce. The gonococci can be found in the discharge and there are no venereal ulcers or other lesions present.

*Syphilitic balanitis* usually depends on the ordinary forms of chancre already mentioned and consists of the chancre plus the balanitis, but there is also a diffuse form of balano-posthitis, called the chancre de Mauriac. In these cases there is no *primary* ulceration, but a diffuse infiltration covering an extensive area of the glans and prepuce, imparting a general feeling of induration on pressure. Sometimes it resembles an extensive erosion. The inflammation is subacute in character and the surface varies in color from a pinkish white to a brawny red. The involved area is thickened and stiffened. This form of initial lesion comes on so insidiously that frequently the patient does not call upon his physician until constitutional symptoms appear. The character of the lesion and the enlarged glands in the groins and elsewhere are sufficient diagnosis, which can be confirmed by finding the spirochetæ. This variety is rare, whereas erosions and ulcerating chancres are common. The balanitis is usually mild when accompanying initial lesions. In pulling the prepuce back in ordinary chancre, as the tissues roll back, the infected area is thicker than the remainder of the rolling tissue and tends to catch and then pop out.

*Secondary syphilis* may give rise to macular or flat papular lesions of the balano-preputial membrane, already mentioned. The balanitis is more extensive than that accompanying the initial lesions, although the localized thickening is not so great. The discharge is more profuse and the odor more marked, especially in the case of the true mucous patch and moist papule. These lesions may occur together with or independent of an eruption on the body.

*Tertiary lues* may involve the glans, causing destruction and deformity of the glans or prepuce, but the balanitis is not marked, except just about the lesion.

Balanitis when associated with chancroids is more acute than when the result of chancres, although the induration may not be so marked. The discharge, however, is more profuse and the odor often offensive.

Balanitis associated with *herpes* is usually very mild and limited to the area of the herpetic lesions. It is more marked when the herpes are ulcerating. Sometimes in a simple balanitis vesicles occur. In such a case it is probable that the vesicles are herpetic and that they are the result of the balanitis rather than the balanitis of the herpes. The discharge in this case is very slight.

Balanitis is also sometimes associated with *verrucæ*. In these cases, the degree and extent of the balanitis or balano-posthitis depend on that of the verrucæ. The discharge in these cases is usually an ichorous pus, quite profuse and having a foul odor.

Balanitis accompanying *epithelioma* may be quite extensive in some cases. The induration may be marked as well as the discharge and the foul odor.

Secondary balanitis is frequently complicated by *phimosis,* and in either case, but especially when associated with phimosis, lymphangitis may occur as shown by red streaks extending along the dorsum of the organ, together perhaps with inguinal adenitis.

Chronic balano-posthitis is generally found in middle-aged men. It comes on subacutely, with an occasional slight exacerbation. The balano-preputial membrane is stiffened, loses its elasticity and has a tough leathery feel. The color of the glans is paler, a bluish white, and is occasionally covered with excoriated patches. It causes a considerable inconvenience to the patient, on account of the constant irritation and the want of freedom and elasticity during coitus. It is a condition which is accompanied by great epithelial hyperplasia and may result in an epithelioma.

Diabetic Balano-Posthitis.—This affection occasionally occurs in a patient with diabetes. It is a very rare complication, however. Durand Fardel, in speaking of his observations of diabetes, stated that he did not see it once in three hundred and forty-four cases. This trouble begins with the usual symptoms of balano-posthitis—that is, itching and burning of the glans and prepuce and redness of the balano-posthitic mucous membrane, together with a profuse and generally foul pustular discharge. The exuded smegma sticks to the mucous membrane forming a membranous-like coating. An artificial eczema of the prepuce develops, at first subacute in character, accompanied by redness and thickening of the skin. Small ulcerations appear around its margin, as a result of the erosions of the mucous membrane and the rupture of its vesicles. These are at first round, soft and flat, but later increase in size and assume an irregular form. Fissures and exuberant granulations, very vascular and tender, may also occur. The prepuce becomes still more indurated from the plastic infiltration into its tissues and around the bases of the ulcerations, thus causing a condition of phimosis, which is so common in these cases that the disease is often known as diabetic phimosis. In some cases where this condition is not relieved, the redness and infiltration become more marked, and a gangrenous dermatitis develops, followed by a slough, more or

less extensive, of the prepuce and perhaps some of the adjoining tissues. In the preputial secretion in this disease, a vegetable parasite is found, recognized by Friedreich as the aspergillus, consisting, as is usual in this class of parasite, of the mycelium and spores. The spores are round or oval and usually occur either singly or in pairs. The mycelium threads are either short and single, or long and branched, and sometimes contain spores imbedded in them. They are considered pathognomonic of diabetic balano-posthitis and eczema and are never found in ordinary smegma. This preputial condition often occurs when there is no other sign of diabetes, and occasionally is the first symptom to point to it. As it has been proved that it may occur in cases where there is a minimum amount of sugar in the urine, it is always advisable, in suspicious cases of balano-posthitis or eczema in this region, to examine carefully the secretion from the parts as well as the urine.

Treatment.—I will now take up the treatment of simple and secondary balanitis. *Simple balanitis* can usually be cured by cleanliness, that is, washing twice a day with warm water, dusting on a powder composed of acid boracic ʒj, bismuth subnitrate and lycopodium each ʒiij and then placing a thin film of absorbent cotton between the glans and the prepuce. If a lotion is preferred, lotio plumbi et opii or lotio nigra may be used every three or four hours as a wet dressing. In applying lotions, the mistake should not be made of using too bulky wads of cotton. A piece of cotton should be taken between the fingers and pulled into a thin film, and spread over the glans; the lotion is then poured over this, which will cause it to flatten to the shape of the parts.

In cases of *chronic balanitis,* with frequently recurring exacerbations, circumcision should be performed, as otherwise it may become malignant later on.

In case of *secondary balanitis,* the lesions to which it is due or with which it is associated should be treated, that is, gonorrhea, herpes, chancroids, syphilitic lesions, verrucæ and epithelioma.

*Gonococcal balanitis* should be treated the same as a simple balanitis plus the treatment of the urethritis.

The treatment of *balanitis with herpes* is the same as that of simple or gonococcal balanitis. If they ulcerate, a solution of nitrate of silver (1 : 10) can be applied to the ulceration, or a five-per-cent solution of chromic acid. The best method of using silver solution on erosions, ulcers, etc., is by means of ordinary wooden toothpicks, with a thin film of cotton twisted around the end. The end of this should be moistened with the solution and applied lightly to the lesion as often as necessary. The regular dressing of powder or black wash should be continued.

In recurrent cases in which the prepuce is tight or the frenum too short, the patient should be circumcised.

Herpes frequently occurs in men who are in poor condition; also in the gouty or rheumatic. If due to any trouble along the genito-urinary tract, this

should be rectified. A mixture containing potassium acetate 15 grains, and sweet spirits of niter 15 minims, should be taken three times a day between meals in a glass of water. If there is much inflammation and pain, as in the neuralgic type, lotio plumbi et opii should be applied.

*Chancres and chancroids* when ulcerating are cauterized with a solution of nitrate of silver, varying in strength from ten to one hundred per cent, and then a wet dressing of lotio nigra is employed. The parts should be washed with warm water night and morning, a thin film of cotton placed on the glans and soaked with black wash, as just described. Every time after this during the day that the patient urinates, he should shake the bottle of black wash and pour from it on the cotton. It is necessary to cauterize the lesion every two to three days until the lesion is healthy, after which the lotio nigra is continued until the ulcer has healed. In cases in which the progress of healing with black wash is not satisfactory, it can be discontinued and aristol used as a dry dressing. I believe that, with an occasional nitrate-of-silver cauterization and a wet dressing of lotio nigra, ninety-nine per cent of herpes, chancre and chancroid cases can be cured. In the case of both initial lesions and mucous patches, mercury should be given up to the point of tolerance. Internally I give tannate of mercury gr. ½ three times a day and increase it gradually up to the point of tolerance; or else I give inunctions, or injections of the cyanid. For mucous patches the same treatment holds good. For gummata, the same local treatment and internally mixed treatment three times a day between meals, with an additional amount of iodid of potash to be taken with each dose until the patient is taking forty grains of potash three times a day.

*Verrucæ Acuminatæ, Venereal Warts.*—These are treated by various methods, such as cauterizing with nitrate of silver, bichlorid or by the actual cautery; curetting and cauterizing the base, or applying persulphate of iron; cutting them off with the scissors; or tying sutures about the base in pedunculated cases, etc. My method of treatment is as follows: The surgeon should first try to destroy them. Every day or two the parts should be washed thoroughly with hot water, the vegetations bathed with a ten-per-cent solution of cocain, then painted superficially with a drachm to the ounce of solution of bichlorid of mercury in collodion and dusted with a powder composed of equal parts of oxid of zinc, tannin and calomel. Before applying the collodion with a camel's-hair brush, vaselin should be smeared about the base of the verrucæ to prevent cauterizing the healthy tissue.

The bichlorid exerts both an astringent and a caustic action, the collodion contracting, while the powder tends to keep the parts dry. This application should be made by the surgeon himself, and the patient should be instructed to wash the parts twice a day and dust on the powder. He should also be instructed to keep the prepuce drawn forward over the glans after these applications; otherwise paraphimosis might occur. If the solution is applied care-

lessly, it may run down between the growths and set up a severe acute inflammation and perhaps a slough.

The best method of treating verrucæ is to place a bandage about the base of the pendulous portion of the organ, cocainize the verrucæ by applying a four-per-cent solution of cocain on a piece of cotton spread over their surface, inject some one-half-per-cent cocain about the base of the verrucæ and then scrape them off with a sharp curette. After they have been scraped from the mucous membrane, little red points will be seen, corresponding to the blood vessels that enter the papillæ of the verrucæ. A compress of absorbent cotton soaked in a 1:2,000 solution of bichlorid should then be wrapped about the part of the organ from which they grew, usually on or behind the glans, and held in place by a bandage. The bleeding usually stops quickly.

*Chronic Diabetic Balano-Posthitis.*—The greatest danger to be feared is of a split in the prepuce which might result fatally from gangrene. Thorough cleanliness, as by irrigations with antiseptic solutions, especially of carbolic acid (1:200) and boric acid (1:30) after each urination should be insisted upon, to be followed by a dusting powder of equal parts of bismuth, borax and lycopodium. It is also advisable to have the patient urinate through a broken test-tube pressed against the end of his glans, so that no urine will touch the tissues. The patient should be placed upon an antidiabetic diet. Often the inflammation is so great that antiphlogistic treatment, by keeping the patient quiet in bed with cloths soaked in lotio plumbi et opii wrapped about the organ, has to be resorted to for a few days. Occasionally gangrene threatens and in these cases it is advisable to perform circumcision immediately with the most rigid antiseptic precautions in order to relieve the pressure. If a slough occurs, the parts should be dressed with charcoal and iodoform, equal parts.

**Phimosis.**—Phimosis is an inability to draw the prepuce back over the glans; and paraphimosis is an inability to draw the prepuce forward over the glans when once it has been drawn back and has become caught behind the corona. Phimosis is often congenital; paraphimosis is always pathological.

Phimosis is of two kinds—congenital and acquired.

Congenital Phimosis.—Congenital phimosis causes a considerable irritation in childhood, and may give rise to serious nervous as well as local troubles. Among the local conditions attributed to phimosis are frequency of urination and nocturnal incontinence of urine. As the individual grows older, other conditions may develop, such as balanitis, sexual erethism, frequent erections, erotic dreams, seminal emissions and imperfect development of the organ. The nervous symptoms which may follow later in life are neurasthenia, chorea, hysteria or hypochondriasis.

In some cases the whole or part of the mucous membrane lining the prepuce may be adherent to that of the glans. In still other cases, calcareous

deposits may form in the interspaces between the adhesions of the glans to the prepuce.

In congenital phimosis the organ looks pointed or wedge-shaped, and there is generally abundant loose integument about its end, even when the prepuce is adherent. On retracting this tissue, the orifice of the prepuce can be seen as a little round tight ring about one eighth of an inch in diameter, and surrounded by fibrous tissue (Fig. 841). In the center of this little ring will be seen a vertical slit, the external meatus of the urethra. The redundant tissue resembling mucous membrane surrounding this ring becomes inverted when the pressure of the fingers is removed, and forms a trough through which the urine escapes.

*Treatment.*—Circumcision is the treatment for congenital phimosis.

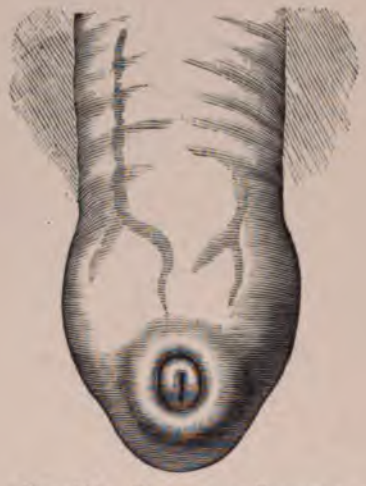


FIG. 841.—CONGENITAL PHIMOSIS. (From Taylor.)

FIG. 842.—ACQUIRED GONORRHEAL PHIMOSIS. (From Taylor.)

ACQUIRED PHIMOSIS.—This term should be applied to a condition in which retraction of the prepuce is prevented by inflammation of the balano-preputial fold in ordinary balanitis; or when due to gonorrhea (Fig. 842), chancre, chancroid, verrucæ, or a new growth as epithelioma beneath the prepuce. The prepuce has become so infiltrated and thickened as to have lost its elasticity to such a degree that it cannot be drawn back over the glans.

*Palliative treatment* consists in the injection of some astringent disinfectant, soothing or cleansing solution beneath the prepuce to reduce the inflammation and heal any lesions present. The injections should be made subpreputially of solutions of bichlorid 1:10,000 to 1:2,000, of permanganate of potassium 1:2,000 to 1:500, or of nitrate of silver 1:2,000 to 1:1,000; a

solution of sulphate of zinc 1:100; or of carbolic acid 1:200. A solution of borax gr. xx, glycerin ʒj and rose water ℥j is of great efficacy in these cases. The patient should make the injections three times a day and hold them in for five minutes each time.

Phimosis due to simple balanitis or posthitis, or to gonorrhea or herpes, if this last condition is ever a cause, is not so severe and more amenable to treatment. Any of the injections first mentioned would probably reduce the inflammation and allow retraction of the prepuce.

In the case of chancroids, chancre, verrucæ or malignant growths, there is, in the first instance, more inflammatory thickening; in the second, there is often an extensive exudate, especially in the diffuse chancre of Mauriac; in the third, there is a distinct obstruction by the benign growths extending into the interpreputial space, besides some thickening at the base of the verrucæ; whereas in the case of epithelioma, there is not only a protrusion of the growth from the inner surface of the prepuce, but also a dense induration of the base and surrounding tissues. In other words, all these conditions tend to diminish the elasticity of the prepuce and to make it unyielding and consequently less retractable.

In the phimosis due to chancres or chancroids, the prepuce is very much inflamed, swollen and edematous. The discharge of pus from the preputial trough is abundant—so much so that in some cases the dripping is almost constant. This pus is of so rich a color that one might imagine an acute attack of urethritis instead of concealed ulceration. This condition is often difficult to diagnosticate. Palpation of the lesion through the prepuce, the character of the inguinal glands, the examination of the discharge for bacteria and protozoa and the history of the patient will usually enable us to make the correct diagnosis. One thing must be remembered, that however bad the case may appear, or however imperative operative procedure may seem, a few days of quiet, with a tonic, if the patient's system is below par, and frequent subpreputial irrigations of warm water, followed by the subpreputial injections just mentioned, will in many cases stop or diminish the amount of the discharge and exudate sufficiently to allow the retraction of the prepuce and permit the regular treatment as in cases of ordinary superficial ulcerations. Very often the condition may be aided by immersing the organ for fifteen minutes every few hours in warm water, or by enveloping it in soft cloths saturated with lotio plumbi et opii and keeping it elevated against the abdomen. Internal treatment with tonics is also recommended in these cases.

If no treatment is pursued, the condition may result, first, in the slough of a part of the prepuce or of the glans, generally occurring in chancroid or chancre; in case that the lesion is phagedenic, the loss of tissue of the glans may result in considerable deformity and leave the urethra bare. Second, it may result in slough due to ulceration through the prepuce; this generally

occurs due to an extensive ulcerating chancroid, to chancre or verrucæ the result of pressure, in which last case the verrucæ may sprout through the opening. Third, ulceration may take place through the dorsum of the prepuce with protrusion of the glans through the hole or window. In this last condition, the protruding glans becomes caught in the window, is pressed upon by its sides and an edematous condition takes place. This may be relieved or reduced by elevation and a wet dressing of lotio plumbi et opii; or else by immersing the organ in hot water every few hours. In all such cases, if subpreputial injections do not begin very shortly to benefit the discharge or inflammation, a dorsal, a " V " incision, or lateral incisions should be made, the lesion inspected and cauterized if ulcerating and treated as open lesions. Circumcision can be performed at once or later, as deemed advisable.

*Operative Treatment.*—In operating on all varieties of phimosis due to subpreputial verrucæ with foul discharge, or with verrucæ sprouting through an opening in the dorsum of the prepuce and even with the glans protruding through the preputial window, I have made a dorsal incision, thoroughly cleaned and disinfected with a bichlorid solution the subpreputial area, curetted away all the verrucæ and followed it immediately with a circumcision without the slightest trouble. It is well to remember that a hot application of gauze soaked in 1 : 2,000 bichlorid should be applied until the bleeding stops. I use 1 : 2,000 at the time, and later apply a dry dressing of aristol.

It is advisable to make a dorsal incision in cases of phimosis due to subpreputial lesions, as it is the first step of circumcision, and allows us to inspect the parts and conclude whether it is better to remove the prepuce, to treat the lesions found, or to make a " V " incision to give more room. Sometimes it is not considered advisable to perform circumcision immediately, if the dorsal incision shows a phagedenic chancroid to be present, or, in fact, in any kind of chancroid, as the infection is liable to spread on account of the autoinoculability of the sore, and a ring of scar tissue may form in the line of circumcision incision causing a contraction later that may interfere with the function of the organ. As I look back, however, over the hundreds of circumcisions performed at the City Hospital during my period of visiting there, in all conditions of slough, gangrene, phagedena, primary and tertiary syphilis, after dorsal, " V " shaped and lateral incisions, often in diabetic patients, I cannot recall a single case in which on account of the lesions the operation harmed the patient; and I can usually recall my bad results and errors. I prefer, however, in the case of chancroids, to make the dorsal incision (Fig. 843 *a b*) or lateral incisions (Fig. 844 *a b*); and if I have good command of the lesions, to dress them for a few days and later complete the circumcision. In case I have not sufficient space, I make a " V " (Fig. 845) or " U " (Fig. 846, *a* and *b*) shaped incision by snipping off two corners of the vertical incision, either diagonally or in a curve. Both of these incisions were introduced by me during my City

Hospital service. The "U" incision results in a fair circumcision after it has healed, and when done in young children is quite as efficient, and no one can tell the difference later in life. A packing of absorbent cotton soaked in a solution of hot bichlorid (1 : 5,000) under the prepuce with a bandage outside, will stop the bleeding after this operation unless an artery is exposed, which will require ligation.

FIG. 843.—DORSAL INCISION IN OPERATION FOR PHIMOSIS.

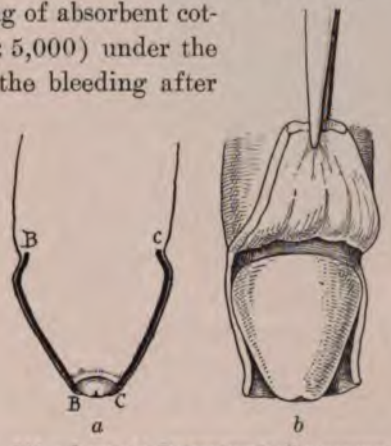



FIG. 844.—LATERAL INCISIONS IN OPERATION FOR PHIMOSIS.

After a few hours, the bleeding stops and the regular dressings are continued as in cases without phimosis.

Regarding verrucæ associated with phimosis, I was formerly in the habit of curetting away the verrucæ first and performing a circumcision later; but I have never had any accident since I have been performing both operations at one sitting.

FIG. 845.—A "V" SHAPED INCISION IN OPERATION FOR PHIMOSIS.

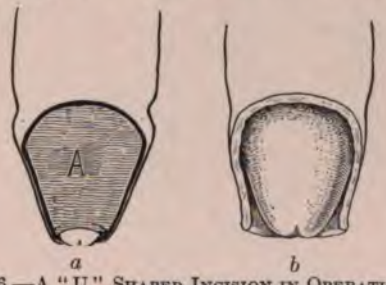



FIG. 846.—A "U" SHAPED INCISION IN OPERATION FOR PHIMOSIS.

*Circumcision.*—This operation was in vogue long before the Christian era, not only among the Hebrews but among various races on the different continents. It has always been a custom among the Egyptians, Arabs, Turks, Persians, East Indians, North and South American Indians, certain African tribes, Australians and other South Sea Islanders. Among different races it was customary to perform it at different ages: Among the Hebrews on the eighth day, among the Egyptians from the sixth to the tenth year and among the Arabs, when they were about to enter puberty. In olden times the methods of procedure were very crude; the prepuce was generally chopped off with a

piece of shell or sharpened stone. As the science of surgery has advanced, other and more delicate operations have succeeded these crude methods, and many clamps and other instruments have been devised for the operation. In my own work, I have discarded all these appliances and do a simple operation, requiring but three cuts. I very often make one of the incisions, the dorsal or the lateral, just mentioned through the prepuce first and later complete the circumcision.

As I mentioned before in this chapter, the prepuce is composed of two layers, one continuous with the skin of the organ and the other the reflection of the mucous membrane from the sulcus behind the glans. These unite, forming the margins of the prepuce. The instruments used are a pair of blunt-pointed scissors, four pairs of artery forceps, two pairs of thumb forceps, round half-curved needles, No. 0 plain catgut and No. 1 chromic.

I may say that circumcision can in nearly every case be performed under the influence of cocain if properly employed. General anesthesia is uncalled for and is generally used in hospital operations so as to avoid the loss of time required for cocain preparation in the operating room. It requires some time, from five to ten minutes, to put the patient under the effects of cocain. I have never seen a case where the parts could not be cocainized.

Before the operation, I mark the proposed line of incision on the organ as it hangs in a flaccid state, allowing for retraction and shrinkage of the skin. I then wind a narrow bandage around the base and ligate it so as to make very slight pressure. This assists the cocainization and prevents the cocain from being carried away by the venous circulation and thus diminishes the amount required.

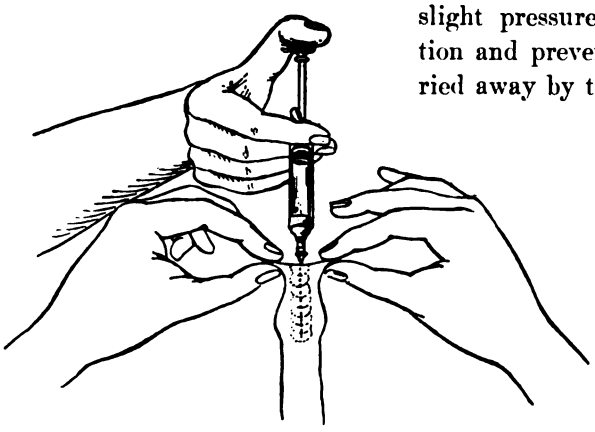


Fig. 847.—Injection of Cocain into the Prepuce.

A cocain solution of a strength of one to two per cent is injected along the dorsal surface of the prepuce from the central point of the dorsal margin to the point at which the removal of the prepuce is contemplated, which is about one eighth of an inch distal to the corona (Fig. 847). When the middle line of the dorsal surface of the prepuce has been injected so as to form a line of blebs to this point, more injections are made in the circumference of the organ at the same distance from the corona, showing the lines to be incised by blebs *B C* and *B D* (Fig. 848). A final injection is made in the margin of the prepuce over the frenum *E* and down to the line of blebs, and a syringeful is thrown under the prepuce and held there to anesthetize the mucous membrane.

The dorsal margin of the prepuce at the juncture of the skin and mucous membrane is caught in the middle line (A) by two artery forceps and an incision made between them along the line of the blebs A B as far as its end B (Fig. 849). An incision is then made on either side from the point B in front along the ring of blebs in the circumference of the prepuce B C and B D to the frenum, removing the skin (Fig. 850). Retraction of the skin then takes place, showing the mucous membrane that does not retract. If the mucous layer is too long, it should be cut shorter with scissors until only a sixth of an inch remains.

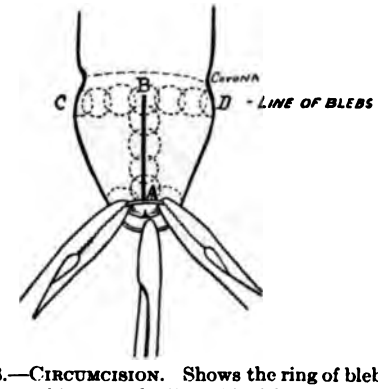



Fig. 848.—Circumcision. Shows the ring of blebs marking out the line of incision.

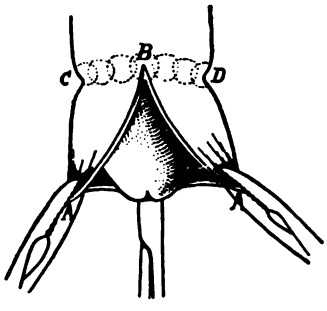



Fig. 849.—Circumcision. Shows the dorsal incision made

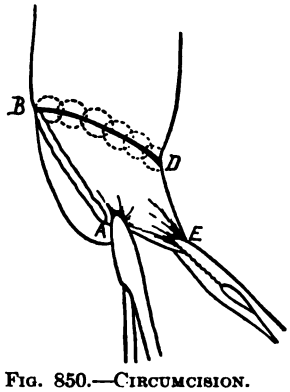



Fig. 850.—Circumcision. Shows the direction of the lateral cut to be made.

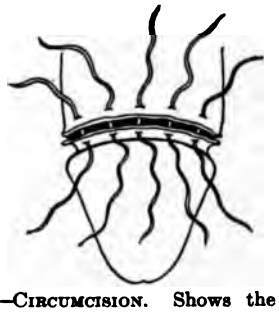


Fig. 851.—Circumcision. Shows the approximated skin and mucous membrane after the prepuce has been removed, with the sutures in place.

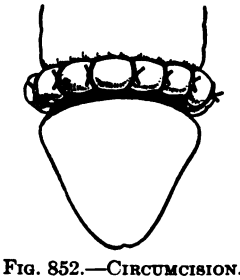


Fig. 852.—Circumcision. Shows the ends of the sutures tied over gauze.

The two layers are sutured together by interrupted sutures (Fig. 851). The ends of the sutures are left long so that a piece of iodoform gauze can be wound around the line of incision between the two ends of each ligature. The ends are again tied over the gauze, and thus hold the dressing in place (Fig. 852).

After the operation, I put a protective dressing of rubber tissue on the end of the glans, leaving a hole for urination. I fasten this with a smear of collodion. The patient is kept in bed for two or three days with a protecting ring about the organ (Fig. 853). I give bromid of potash to prevent erections. Sixty grains a day given in fifteen-grain doses usually suffices. This applies to a case of phimosis in which no ulcerations or verrucæ are present.

FIG. 853.—PROTECTING RING PLACED ABOUT THE ORGAN AFTER CIRCUMCISION AND PREPUTIAL INCISIONS.

**Paraphimosis.**—This term applies to a condition in which the margin of the prepuce becomes strangulated behind the corona of the glans; it may be either reducible or irreducible. It occurs generally in cases of gonorrhea, chancroid or chancre; although it may result from such causes as too much coitus in an individual with a very tight prepuce. A recent condition of this kind is easily reducible; but after a few days a plastic infiltration takes place

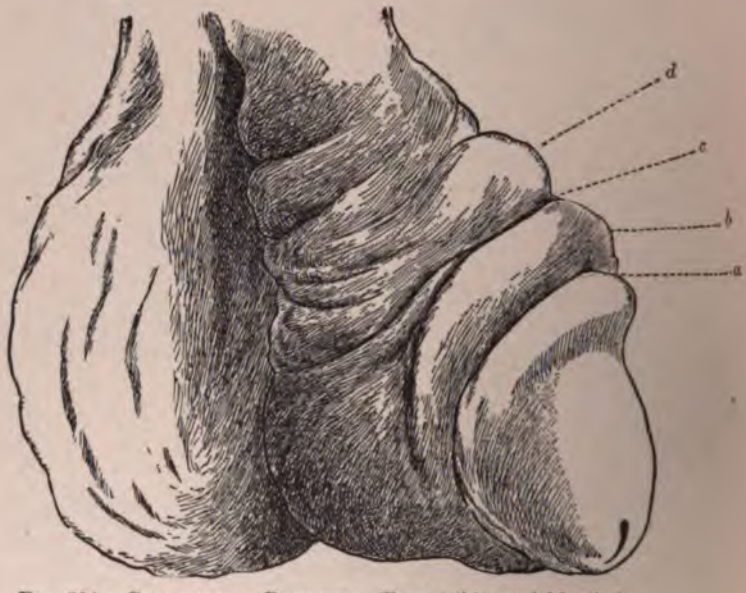



FIG. 854.—CONDITION OF PHIMOSIS. (From White and Martin.)

into the strangulated tissues, adhesions form and reduction may be impossible unless the restricting bands are cut, and even then it is effected with difficulty. The appearance of the organ in this condition is enlarged, the glans

swollen, red and tense (Fig. 854). Over and behind the sulcus is a brawny swelling densely infiltrated, which in old cases has a hard and cartilaginous feel, especially when due to the initial lesion of syphilis. Below this, the tissues are inflamed and edematous and, behind, the organ presents a wrinkled appearance. If no treatment is given, the exudate may be absorbed and the prepuce again brought forward, or else it may remain permanently behind the glans. Ulceration will probably take place through the constricting preputial orifice, thus relieving the strangulation. It may in rare cases result in considerable slough, involving both the skin and the glans, although I have never seen gangrene except in phagedenic cases.

Fig. 855.—The Method of Reducing Paraphimosis.

The treatment of paraphimosis consists in cleansing the parts and anointing the involved region with some vaselin or oil. If the retracted prepuce is infiltrated with serous fluid, punctures may be made, allowing the escape of this fluid, thus assisting in the reduction. The best method of reduction is to grasp the glans between the thumb, fore and middle fingers of the right hand, then grasp the body of the organ between all the phalanges of the left hand with the forefinger just behind the constriction. Then press the blood out of the glans with the fingers of the right hand, thus diminishing its size and at the same time endeavoring to push the constricting ring over the reduced glans with the left hand (Fig. 855). Then work the finger nails under the preputial constricting ring. This can usually be accomplished within a day or two after its occurrence and sometimes four or five days later. If not, it should be soaked in hot water three or more times a day for a period of ten minutes, and a wet dressing of lead-and-opium wash kept on and the organ supported against the abdomen by an appropriate bandage. In

Fig. 856.—Method of Reducing Paraphimosis by Operation. (From Keen.)

case gangrene of the glans or an extensive slough threatens, the constricting band must be incised immediately with a curved bistoury, by pushing a probe-pointed grooved director under the constriction and cutting upon it (Fig. 856). Great care should be taken not to wound the organ itself and some prefer making a number of small cuts until the ring yields. In twenty-five years' experience with these cases, I have never had to use the knife in a case of paraphimosis. The operation of circumcision had best be performed after the reduction of the paraphimosis.

## DISEASES OF THE CORPORA CAVERNOSA

**Acute Inflammations.**—Acute inflammations are rare and generally follow fracture or wounds of the penis while the organ is in a state of turgescence. A phlebitis may result, together with a plastic infiltration into the tissue, showing itself as a slight redundancy and causing some pain and tenderness on pressure. This principally inconveniences the patient when erection takes place, causing some pain and giving rise to a curvature on that side, due to an incomplete turgescence of the corpora cavernosa at that point. The inflammation may occur on one or both sides. In the course of an attack of gonorrhea, the inflammation may extend to the corpora cavernosa and produce an effusion of plastic lymph affecting the cavities of these bodies and also interfering with complete distension in the state of erection of the organ. The same effect may be produced by small deposits in the substance of the corpora cavernosa, the cicatrization of which always entails a deposit of a certain quantity of plastic tissue. This likewise causes a curvature toward the affected side, and in exceptional cases, where both sides are affected, erection may take place posteriorly to the trouble, while a portion of the organ in front remains flaccid. Abscess of the corpora cavernosa occasionally occurs. Tuberculosis may also develop in these bodies and about them, causing a deformity of the organ.

Treatment.—When the disease of the corpora cavernosa is acute, and pain and swelling are present, some antiphlogistic remedy, such as lotio plumbi et opii, may be applied locally, and camphor, bromid of potassium or lupulin given internally to prevent erections until the inflammatory stage has passed over; after which the alteratives, iodid of potassium or mercurials, both externally and internally, should be employed. In cases of abscess of the corpora cavernosa, poultices should be applied and the abscess opened as elsewhere.

**Chronic Inflammations.**—Chronic inflammations are more common, especially the variety characterized by the development of thin fibrous growths or plaques. They usually develop in middle-aged men who have suffered from attacks of urethritis. These may occur on one side, on the dorsum, or they may be multiple. They vary in size from a pumpkin seed to that of a lima bean, and are hard, with a well-defined border. A dull pain may exist. They

cause a curvature toward the affected side. Sometimes there are two present on the organ, one on the dorsum near the pubes, the other on the side just behind the glans, causing a double curvature on erection. Cases have been reported in which the fibrous wall of the corpora cavernosa was irregularly indurated and there was thickening and consolidation of the erectile tissue within. The patient complained of lancinating pains in the penis and scrotum. Erections were painful and gave rise to a twisted appearance of the organ.

TREATMENT.—The treatment consists of tincture of iodin externally and iodids internally. Some favorable results have been reported from the use of ointments of iodid of mercury, which have as a base lanolin, their greater efficiency depending upon the fact that they cause the medicines to penetrate through the tissues more readily.

These plaques have occasionally been dissected away from their seat. I have had patients with such lesions and have told them that they might be relieved by operation, but that I could not promise a cure. None of these patients cared to take the chances and I must confess that I have not felt I could offer much hope.

**Bony and Calcareous Plates.**—Bony and calcareous plates may occur in the corpora cavernosa. Dr. William Porter reported a case in the *Medical Record* some years ago of a man, aged sixty-three, who had a small tumor on the right side of the organ attached to the fibrous tissue of the corpora cavernosa. This was cut down upon and shelled out. It proved to be a bony mass or plate six centimeters long by three centimeters wide. It contained lacunæ and canaliculi. These bony growths often develop in the furrow between the two corpora cavernosa to which they are attached.

In the Museum of Pathological Anatomy in Vienna is a plaster cast of an organ with a bony growth in the dorsum between the corpora cavernosa, which bifurcated in about the middle of its course.

**Gummata of the Corpora Cavernosa.**—Gummata are not as frequent in the cavernous bodies as they are in some other parts of the organ, the favorite seat being the furrow between them. They may be single or multiple. They appear as nodes in the substance of these bodies and may cause curvature of the penis. They may remain indolent for a long time, then break down, or, under specific treatment, undergo resolution. The treatment is the same as for gummata elsewhere.

# CHAPTER LXV

## BUBO

### (*Inguinal Adenitis*)

INGUINAL adenitis consists of an inflammation of one or more glands in the groin.

Bubo is usually understood as the form of inguinal adenitis in which there is a swelling or *tumefaction* of one gland with considerable periglandular inflammation, or of a number of glands massed together with inflammation about them.

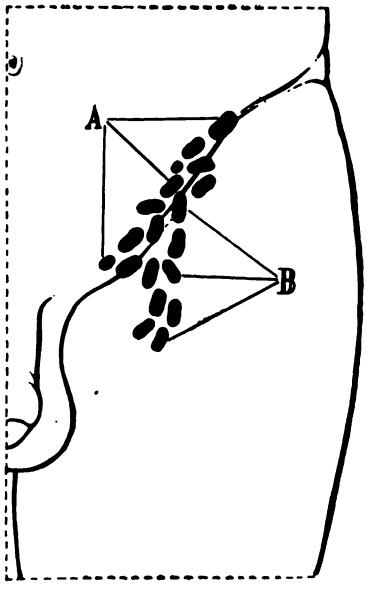



FIG. 857.—ARRANGEMENT OF THE SUPERFICIAL INGUINAL LYMPHATICS FOUND IMMEDIATELY UNDER THE SKIN. They vary from 18 to 20 in number and also in size. They may be divided into two groups: *A*, an upper horizontal set, irregularly distributed along Poupart's ligament, draining the penis, urethral mucous membrane, abdominal wall below the umbilicus, the perineal and gluteal regions. *B*, an inferior vertical set surrounding the saphenous opening and drawing the superficial lymphatics of the limb.

The inguinal glands are divided into two sets, the superficial and the deep.

The superficial, from fourteen to fifteen in number, lying just beneath the skin, consist of two groups—a horizontal parallel to Poupart's ligament and a vertical parallel to the saphenous vein. The horizontal drain the mons veneris, the external genitals, the anterior part of the perineum, the lower part of the abdomen, the lower part of the back, the lumbar region, the buttocks and the posterior part of the perineum. The vertical set drains the surface of the lower extremity (Fig. 857).

The deep set, four or five in number, are situated beneath the fascia lata and the saphenous opening, and extend along the femoral vein. The glands of this group are involved only in diseases affecting the lower limbs. They pass beneath Poupart's ligament and connect with the external iliac glands. One of these glands is in the crural canal surrounded by dense structures. This deep set communicates with the superficial set through the saphenous opening. The lymphatics accompanying the obturator, gluteal and sciatic ves-

sels and the deep vessels of the penis pass into the pelvis and have nothing to do with the inguinal glands.

**Etiology.**—The causes of bubo are blennorrhagia (gonorrheal), chancroid, lues, inflammatory infections other than venereal, malignant growths, filarial troubles as elephantiasis, and Hodgkin's disease. These causative conditions are located principally on the external genitals; or on the perineum, buttocks, the surface of the abdomen below the umbilicus; or on the surface or deep regions of the lower extremity. The so-called venereal diseases—chancroid, chancres and gonorrhea—are the principal causes. Chancroid is the most common cause, lues next and gonorrhea last. The infection of bubo is either the specific micro-organism of the lesion from which it extends, some secondary infection such as the staphylococcus or streptococcus, or toxins generated by the microörganism. The gonococcus is not found in the blennorrhagic bubo, but the Bacillus Ducré may be found in the chancroidal variety. In the remaining varieties—tuberculosis, malignant growths, Hodgkin's disease and filariasis—the specific microörganism of the disease, or other infections accompanying it, or the toxins of the microörganisms, are present.

Bubo d'emblée is an interesting variety, as the cause is unknown. Infection has taken place, however, either through the blood, or from some local injury or a suppurative lesion which has existed but has either been overlooked or forgotten. For a long time buboes of slow growth that could not be ascribed to any cause were spoken of as tubercular, and yet tubercle bacilli were found in less than five per cent of these supposed tubercular cases.

The microörganisms, especially of the pus-producing variety, that assist as a secondary infection in the production of buboes, are the streptococcus and staphylococcus. As chafes, wounds, bites, intertrigo, ulcers, furunculosis and eczema of the lower extremity and genitals are often accompanied by infection, it is easy to understand how such a bubo can originate.

The chronic variety embraces glandular enlargements from a number of causes usually other than venereal, which run a slow course. Lues is also included in this group as well as in the acute group. The other varieties in the group are the tubercular, the malignant and those occurring in Hodgkin's disease and in elephantiasis.

**Symptoms.**—Symptomatically buboes are divided into two chief classes, the acute and the chronic. The acute variety is again divided into two classes, simple acute and virulently acute.

Simple Acute.—In the simple acute bubo, the mass in the groin may begin as a small, oval or rounded swelling, usually parallel to Poupart's ligament in its long diameter. It is of a white color at first, and then gradually becomes reddened, tender. It may undergo resolution without reaching the stage of suppuration. If suppuration takes place, the skin softens and becomes thin and a point of fluctuation may be felt, although its base may feel hard. When it is

opened or breaks, the floor and edges have a fairly healthy look and are bright red in color. Pain is one of the principal symptoms of simple acute bubo and it is at times very marked. This is especially the case when the deep set of glands under the fascia lata are involved, or the gland in the crural canal. The pain and tenderness are at times exquisite when a large superficial bubo ripens and is nearly ready to be opened. The pain may be of a throbbing character.

Fever may be present in some acute cases in a varying degree, and when pus is present it is accompanied by chills and sweating.

Virulent Bubo.—The virulent bubo develops in the same way, although it usually advances more rapidly and is more red and angry looking; when it breaks down and is opened or bursts, it looks different. Its edges are irregular; its base is uneven and covered by a slough; a brownish-yellow pus exudes from it, mixed with remnants of necrotic tissue. When it follows a chancroid, it has a chancroidal appearance with a tendency to enlarge. It may extend, destroying tissue for weeks.

Fig. 858.—Virulent Chancroidal Bubo. (From Lydston.)

Buboes in gonorrhea occur in but a small percentage of cases. The glandular involvement is generally on both sides and affects only the nearest glands of the superficial horizontal group. It generally shows itself in the groin during the last part of the first stage as a small tumor about the size of a half walnut, of a pink color, painful on pressure or on walking about. It usually subsides quickly without treatment. Sometimes it increases in size and suppurates, especially in patients who indulge in excesses during an attack of urethritis. It is due to other infection than the gonococcus.

In *lues,* usually all the inguinal glands on both sides are slightly enlarged individually during the secondary stage. They vary in size from a small bean to an almond and then continue chronically enlarged for some time. The bubo

that forms is a subacute or simple bubo and is composed of a mass of glands welded together, that either slowly undergoes resolution when the patient is on mercurial treatment or else gradually breaks down and suppurates. Such a bubo may remain chronic for months. Frequently, as the result of mixed infection, the virus of chancroid is taken in as well and a very acute or virulent bubo may result having all the appearance of a chancroidal bubo.

FIG. 859.—SPICA BANDAGE.

*Gummata* of the inguinal glands are rare. They are round or oval, have an elastic feel, an uneven surface and vary in size from a cherry to an egg. They break down and discharge a grayish pus. They may destroy a considerable amount of tissue and have been known to cause a quite severe hemorrhage.

In *chancroid,* buboes are said to occur in from five per cent to thirty per cent of the cases. It generally develops from the second to the fourth week, usually involving the glands of the superficial horizontal group on but one side, except when the lesion is situated on the frenum, or there are lesions on both sides of the organ, when the swelling may be bilateral.

Pain on motion is first noticed, then a hard tender tumor is felt beneath the skin which constantly increases in size. The symptoms may diminish in severity and the mass may undergo resolution, but it generally goes on to the formation of pus, in which case the skin becomes red and inflamed. The patient may have fever, rapid pulse and sweating. The bubo may break down externally or internally, followed by the involvement and breaking down of the periglandular tissue. It is then converted into an abscess cavity with necrotic walls.

The *true chancroidal bubo* is one that is very acute and breaks down in a few days, leaving a large raw surface with a sloughy base and irregular worm-eaten margins, corresponding closely to a chancroid in appearance, in which case it is called a chancroidal bubo. The virulency of the sore has, however, nothing to do with the production of a bubo, as phagedenic sores are often unaccompanied by a suppurating bubo (Fig. 858).

*Inflammatory buboes* occurring independently of venereal disease may be due to ulcerations, chafes, bites of insects, wounds, skin diseases such as scabies, eczema, ecthyma, furunculosis, or any other infection, superficial or deep on the lower extremity, or about the lower abdomen, buttocks or perineum. Sometimes they are very acute and rapidly break down and suppurate. They may be either mild, simply acute, hyperacute or virulent. The lesions from which they originate may not be present at the time. One of the worst cases of bubo that I have seen next to the chancroid variety, occurred in a patient who chafed his heel while wearing tight patent-leather shoes and gaudy colored silk socks. A red line showed the path of the lymphatic infection to the groin, preceding the development of a virulent bubo.

Inflammatory bubo may develop where no signs of a local infection of any kind can be found; these are called by the French "bubo d'emblée." A cause for the buboes has, however, been present, whether a toxin or a microörganism, it is impossible to say. If a patient is cachectic owing to Bright's disease, alcoholism, tuberculosis, malaria, or diabetes, the bubo is apt to be of a more severe type.

Chronic Bubo.—In the chronic type, buboes are either individually enlarged or in a mass. They are usually more or less flattened and infiltrated, although they may be very large and globular. They are very hard or they may be soft, depending on the process they represent. They are white in color, yellow sometimes, or red. They may undergo resolution slowly or suppuration may slowly develop in one or more of the glands going to make up the mass, or the entire mass may break down together. In chronic cases, there may be no elevation of temperature and only a slight febrile movement after pus has formed and the abscess is ready to be opened.

In *lues*, as we have already mentioned, there may be a chronic enlargement of the glands individually, following the general enlargement in the first or the secondary stage; or there may be an indolent mass of glands on one side or both sides, which may last for months and then slowly undergo resolution or else break down and suppurate *en masse* or in sections.

*Tubercular Adenitis.*—The glands seen clinically are of two types: Single or multiple isolated glands or a mass of glands (*en paquet*). In the first case we have separate glands indolently inflamed. They may remain indolent for a long time and then slowly diminish in size, although generally they break down and, having discharged, leave a sinus which finally closes. The agglomerated glands may suppurate quickly, but perhaps in sections, leaving numerous sinuses that discharge for some time.

*Neoplastic Adenitis.*—This is due usually to epithelioma or carcinoma. The glands are hard, painful, very adherent to the surrounding tissues and they may finally suppurate, discharging pus and detritus with a peculiar fetid odor.

In Hodgkin's disease, the glands are indolent on one or both sides secondary

to enlargement in the neck and axilla. They vary in size and are often large globular masses. They are rare and seldom suppurate.

*Filarial Buboes or Varices.*—The Filaria sanguinis produces a soft, painless, semifluctuating tumor, the size of an egg or larger, with nodules felt in places throughout the tumor. It is reducible, as its contents can be squeezed out into the abdominal lymphatic channels. The skin over this tumor is white and not adherent. The local glandular swelling is often the only symptom of the disease. It is generally seen in the southern part of Asia, although it is occasionally found in the northern part of Africa and Brazil.

The tumor is liable to be mistaken for a hernia on account of its being reducible. The finger inserted into the inguinal canal, however, will show the difference, as the rings are not enlarged and there is no impulse on coughing.

**Treatment.**—Preventive Treatment.—The preventive treatment consists of the careful washing of the genitals after coitus, followed by a cleansing with a 1 : 3,000 solution of bichlorid. This tends to prevent the development of lesions upon which the venereal buboes depend.

Abortive Treatment.—I am in the habit of trying to abort every bubo, before there is any evidence of suppuration, by means of an iodin compress.

The detail of applying an effective *iodin compress* consists in shaving the parts; applying a thick coating of iodin to the swelling with a camel's-hair brush; placing over it a layer of gauze or sheet lint, smeared with glycerin; then a pad of oakum or cotton batting or a combined dressing, and holding this in place by means of a spica bandage. It must be remembered, in putting on a spica which makes a figure eight in the groin, to bring the fold of the bandage running parallel with the groin from below upward, as by this means it will be kept much more firmly in place. It is also well to pin it at the beginning and end and in various places after it has been put on, so that it will not slip. It is advisable to put on such a compress twice a day, if possible; but as this is usually not convenient for the patient, it is generally done once a day (Fig. 859). During such treatment, if there is any sign of suppuration, if

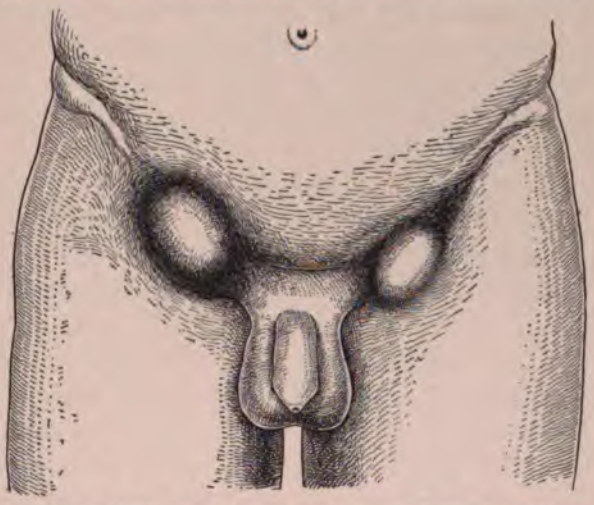


Fig. 860.—Bubo on the Right Side Going on to Suppuration and on the Left Side to Resolution. (Diagrammatic.)

the inflammation is increasing or if the patient complains of great pain, we must at once discontinue the treatment and resort to hot poultices (Fig. 860).

*Poultices* are very efficacious in bubo, as they hasten suppuration in cases that are breaking down slowly, and hasten resolution if suppuration has not begun. In many cases, I have given up hope of being able to abort the bubo or effect resolution and changed my treatment to poultices, expecting the bubo to break down and suppurate, when much to my surprise, the inflammation rapidly subsided and it healed without need of operation. It would therefore appear that in all cases poultices are the most effective, as by increasing the circulation in the tumor, they hasten the process of either resolution or suppuration.

*Ice bags* are frequently employed, especially in very acute cases. They relieve the pain but do not assist the progress of the disease as well as poultices and are therefore not recommended.

*Injections of iodoform* ten per cent, in vaselin or glycerin, have been much employed and sometimes give excellent results. The iodoform is injected in some cases into a bubo that has not begun to break down, which procedure I cannot recommend; but when injected into buboes into which pus has already formed, they are sometimes most efficacious. In these suppurative cases, as soon as pus is detected, it is aspirated, after which the pus sac is washed out through the aspirating needle and then a sufficient amount of iodoform mixture is injected to fill the cavity. The needle is then withdrawn and a piece of plaster placed over the puncture to seal it, after which an ice bag is put on, which can be kept on for from twelve to forty-eight hours. In this way the inflammation often subsides and the bubo heals. If it does not, however, it should be operated upon.

Operative Treatment.—The operative treatment of bubo consists of simply opening and draining or of removing it. Incision and drainage is by far the safest method. The bubo should not be opened until it has thoroughly broken down, as a more satisfactory free incision can then be made. Cocain or ethyl-chlorid anesthesia can be used to anesthetize the parts. Cocain is not usually applicable, as the surface is so stretched that it is too thin for intradermic injections. Ethyl chlorid sprayed upon the part is usually satisfactory.

In opening the bubo, the incision should not be transverse, as it is frequently made, as in this case when the patient is seated the two sides close and interfere with drainage. A vertical incision, extending from the lower part of the bubo up as far as the suppuration exists, is the better, as in this case free downward drainage takes place when the patient is standing, and when he is sitting the sides gap, making the drainage even more free. After the incision is made, the pus escapes and the operator then takes a piece of gauze, winds it about his fingers and thoroughly wipes out the cavity. This is much

better than curetting with a sharp curette, as, when an operator is curetting the bottom of an abscess cavity in this location, he may injure some important vessels. After the cavity has been thoroughly wiped out with dry gauze, it is washed out with 1:1,000 bichlorid solution and packed thoroughly with half-inch gauze soaked in the bichlorid solution. It may sometimes be packed with absorbent cotton soaked in bichlorid. This stops any bleeding that there may be and usually a fairly clean wound is seen at the next dressing. A combination dressing and a spica bandage are placed over this.

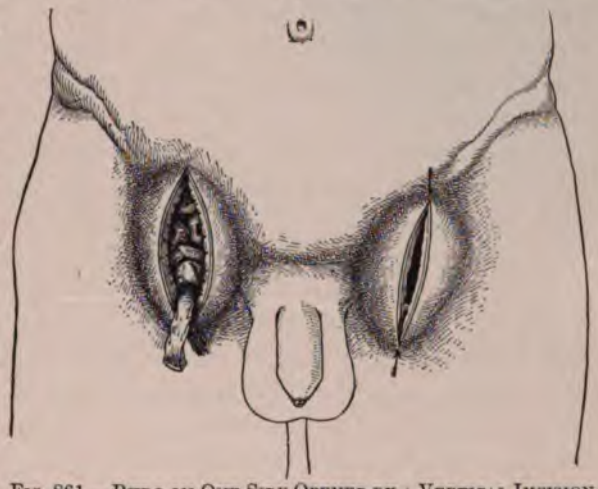


Fig. 861.—Bubo on One Side Opened by a Vertical Incision and on the Other a Bubo Packed with Strip Gauze.

The further dressing of the wound depends upon its appearance. It is washed out daily with bichlorid solution or peroxid and packed with iodoform or balsam of Peru gauze. Ichthyol ten to thirty per cent, in glycerin, is sometimes used. The dusting powders of iodoform or aristol are also beneficial. Sometimes, and especially in chancroidal cases, the base may be sloughy or necrotic. In such cases a dressing of equal parts of charcoal and iodoform will in a few days change the appearance of a bubo from a sloughy, unhealthy-looking lesion to one that is clean and red. With all these dressings, wet or dry, a gauze drain or packing has to be employed to make the wound heal from the bottom (Fig. 861). Sometimes, and especially in chronic cases due to tuberculosis or lues, the bubo may break down in sections and, when opened, a sinus may extend down to the slowly suppurating masses, sometimes beneath the fascia lata.

In these cases it is necessary to follow up the sinus, open it thoroughly and pack it with iodoform gauze, iodoform and charcoal, balsam of Peru or ichthyol. Internal treatment is also of great assistance in these cases—mercury or mixed treatment in the luetic cases, creosote in tubercular cases and iron, strychnin and a small amount of quinin in all cases.

*Removal of the Glands: Enucleation.*—Many operators say that this is the best surgical procedure. "Clean them right out and there will be no more trouble"; but sometimes there is and a patient loses his life, or a limb.

The cases in which such an operation is indicated are the luetic buboes, or those from any cause in which the inguinal glands on one or both sides are quite enlarged and indolent.

An incision should be made from just above the highest glands involved, down and just to the inner side of the femoral vessels, and a careful dissection of the glands should be made, one gland after another being removed with the expectation of finally arriving and finding diseased glands by the side of the femoral vein. The operator in a case of extensive enlargement may feel that it is safer to cut down first to the sheath of the femoral vein, locate and expose the seat of danger and dissect up from this point.

The picture that presents itself in operating on these cases, however, is different. Gland after gland may be extirpated from the thickened mass; some are as large as a bean, others the size of a hickory nut. Some of these shell out easily in their entirety; others break and mash into masses of pus and detritus between the fingers. After we have removed the superficial glands that are involved, we often find that those of the deep group are also affected, and feel obliged to go down beneath the fascia lata and often into the crural canal. The saphenous vein is often cut and the femoral vein is sometimes torn or nicked. The blood that wells out of the vein following this accident is sometimes appalling and enough to disturb the composure of the calmest surgeon; but he must remember to put one finger over the bleeding point, put a very hot gauze compress into the bleeding cavity, and, on removing it, grasp the bleeding point in the long diameter of the vessel with the convex side of a very thin pair of artery forceps, and then ligate with fine silk or fine chromic gut. I rather used to pride myself on my dissection of the inguinal glands, and my first mishap was the accidental nicking of the femoral vein, which I secured after a fair amount of hemorrhage. I then began to investigate the accidents that could follow this dissection and learned that fatal hemorrhages, hemorrhage requiring the ligation of both iliac vessels, gangrene of the extremity, septic phlebitis, pyemia and other complications could follow. Later on I dissected out the glands in a patient with indolent adenitis, and the patient developed edema of the external genitals lasting for five months, and shortly after this a patient entered my ward at the City Hospital with an edema of the scrotum reaching nearly to his knees and a preputial trough four inches long. Later on, my house surgeon operated on a case, dissecting out the glands on one side contrary to orders and the patient developed a septic pneumonia and died. Since then there have been no operations in my wards, other than incisions and wiping out the cavity with gauze and packing. I may also add that, for no reason unless perhaps malignancy, would I again attempt to enucleate glands in the groin, and I do not think even in that case that the operation would have much effect on the longevity of the patient, as he would probably have malignant glands develop higher up behind the peritoneum.

# CHAPTER LXVI

## DISEASES OF THE SCROTUM

THE scrotum is a bag which holds the testes. It is composed of several layers: The skin; the dartos sheath below this, which is a fascia containing muscular fibers and continuous with the superficial layer of the perineum and that of the groin; a cellular layer; and the parietal layer of the tunica vaginalis besides other layers reflected from the groin. (See chapter on Anatomy.)

The diseases are principally those of the skin and the cellular tissue. I will first consider skin diseases, and later take up the consideration of the principal special disease, elephantiasis. I shall merely make a few remarks on the different diseases, as they belong rather to a work on dermatology than to one on urology.

**Dermatitis.**—Dermatitis is an inflammation of the skin due to irritation. This may result from the use of mercurial ointment in treating pediculosis or to other irritants. The form of dermatitis particular to diseases of the scrotum is dermatitis venenata, in which the irritation consists of a poison found in a wild (poison) ivy. People living in the country are especially prone to come in contact with this plant when in a squatting position with scrotum uncovered or but sparsely covered. The hands or some other parts of the body are usually involved as well.

SYMPTOMS.—The symptoms are a burning and itching sensation followed by an erythematous eruption with a reddened, thickened, infiltrated derma. The eruption is accompanied by swelling and pruritus.

TREATMENT.—Give a calomel purge, followed by a saline laxative in the morning; twenty grains of acetate of potash and thirty minims of sweet spirits of niter, three times a day, in a glass of water between meals. Locally apply a wet dressing of lead-and-opium wash or simple oxid-of-zinc ointment.

**Eczema.**—Acute eczema of the scrotum is usually of the vesicular type, which is liable to become chronic if not relieved. It is due to the decomposition of the perspiration, to irritation of the urine, or of the clothing. In the chronic form it may be lichenoid, rubrum or seborrheal. There is sometimes marked thickening of the skin due to infiltration. It may be furrowed or fissured.

SYMPTOMS.—The symptoms are principally itching and a leaking of serum which sometimes causes the clothing to stick to the affected area, giving rise

to great discomfort. In the chronic cases, the itching is often intense, especially at night in the lichenoid variety.

TREATMENT.—The treatment of eczema of the scrotum consists in not washing the parts too frequently after the first cleansing wash, and in the successive washings to use water with the chill removed. The same internal treatment is given as in dermatitis, but in slightly smaller doses. Externally, a powder is applied, consisting of bismuth one part, lycopodium seven parts; or bismuth and boric acid each one part, lycopodium and starch, each three parts; putting a piece of sheet lint or gauze over this and then a suspensory bandage to hold it in place. The powder keeps the parts dry and the sheet lint or gauze absorbs the moisture.

The fissures in the chronic cases are treated with an application of a ten-per-cent nitrate-of-silver solution. Diet, tonics and remedies for a gouty or rheumatic diathesis are used when indicated.

**Pruritus.**—Pruritus or itching of the scrotum is a term used as such to describe the symptom in eczema, pediculosis and other troubles that tend to localize themselves on or about the scrotum.

Pruritus is sometimes spoken of as a disease when the itching is present without any other local manifestation. In such cases, it occurs in people of a gouty or rheumatic diathesis, and follows a course that at times may result in other manifestations, such as an involvement of the joints. The itching is often relieved by pinching or pulling the skin as well as scratching.

TREATMENT.—This is directed to the cause. In case it is due to a uric-acid diathesis, antirheumatics and baths are prescribed and saline eliminants and laxatives are given to affect the bowels and kidneys.

Locally: Menthol grs. v and resinol oz. 1.

**Intertrigo.**—This consists of a chafe between the scrotum and thigh involving both. It is due to an irritation usually following a maceration of the epidermis caused by sweating; or it may be due to the irritation of unclean underclothing that have been soaked with sweat and have become hard after drying; or to horseback riding.

The condition is often accompanied by a foul stench. The treatment consists in washing the parts with soap and water, of dusting on a powder composed of boric acid ʒss, bismuth ʒj, lycopodium and starch āā ʒss and wearing a swath of gauze with a pad of cotton in the cleft between the scrotum and thigh to keep the parts dry.

**Eczema Marginatum** (*Tinea Trichophytina Cruris*).—This is a combination of ringworm and eczema. It starts as a ringworm of the thigh near the scrotum and is aggravated by chafing, especially in horseback riding and in marching. The margin or border containing the fungus is thicker than the tissues beside it. The inflammatory area behind the advancing parasitic mar-

gin is the eczematous area, which is principally in the cleft between the scrotum and the thighs, from which point it extends along the scrotum as well as along the thigh. It may extend up to the groin. The eczematous part is bright red in color. The disease is usually chronic and the itching persistent. The friction of the adjoining skin surfaces and the decomposition of the sweat assist in keeping up the irritation.

TREATMENT.—Keep the parts clean by washing with tepid water. Apply sulphur ointment, or equal parts of ammoniate of mercury and zinc-oxid ointment, to the advancing margins. Dress the eczematous areas with a powder containing boric acid ʒss; bismuth ʒj; lycopodium and starch āā ℥ss. Wear a suspensory bandage with pieces of absorbent cotton, sheet lint or gauze tucked along its side in such a way as to cover the eczematous portions and keep them dry.

**Pediculosis.**—Pediculi of the pubes extend to the scrotum as well, where they show themselves as brown spots on the skin near the base of the hair and with ovoid bodies on the hair, the former of which are the parasites and the latter their eggs. The pediculi may invade other hairy parts of the body, as the eyebrows and axilla. The treatment consists in washing the scrotum with soap and water and then applying ammoniate-of-mercury ointment or tincture of delphini.

**Sebaceous Cysts.**—Sebaceous cysts frequently occur in the scrotum, and are usually about the size of a small pea. They are generally multiple. They do no harm and do not tend to become malignant. In case the individual desires to have them removed, the larger ones can be enucleated through an incision over them; whereas the contents of the smaller ones can be squeezed out with the fingers and opened, curetted and cauterized; or they can simply be grasped by thumb forceps and cut off with curved scissors.

**Erysipelas.**—Erysipelas of the scrotum is a rare condition and may be the result of injuries to the scrotum or the adjoining tissues.

Phlegmonous erysipelas sometimes occurs in the old and cachectic individuals. In these cases, the scrotum may become very much enlarged, red, tense, shiny and mottled. Extravasation of urine has been considered by some observers as belonging to this form of erysipelas. The general symptoms of phlegmonous erysipelas are those of a typhoid state with high temperature. It may result in gangrene.

TREATMENT.—Multiple incision should be made, relieving the tension and allowing the drainage of infiltrates, and later an antiseptic wet dressing should be applied; or, if there is much slough, equal parts of iodoform and charcoal. The remainder of the treatment should be similar to that of erysipelas in other parts of the body, supportive and locally a wet dressing of bichlorid (1:4,000).

**Gangrene.**—Gangrene of the scrotum is a rare condition. It is usually met with in connection with rupture of the urethra due to traumatism, and has

already been considered in the section on The Urethra. It is also due to erysipelas, thrombosis, embolism, syphilis, diabetes and tuberculosis.

There is a variety of scrotal gangrene known as "spontaneous gangrene." The predisposing cause of this condition is alcoholism, and the exciting cause is believed to be of bacterial origin. I have seen but one case of this variety, which was transferred to my service from the medical ward of the City Hospital. The gangrene had appeared suddenly and was not associated with an injury, nor disease of the urethra or testis, nor any of the causative diseases above mentioned except alcoholism.

The scrotum becomes swollen, attaining a large size. At first it has a red color, but it gradually becomes dusky, then dark gray or black. Sometimes within twenty-four hours, a line of demarcation forms and sloughing begins, leaving one or both testes exposed. The penis may also be involved. Local tenderness and heat, and sometimes fever, are also symptoms of this condition.

**Edema.**—Edema of the scrotum is the accumulation of serum in its cellular tissue layer. It may be part of a general edema, or anasarca, in diseases of the heart or kidneys, in which conditions the scrotum is sometimes the first part of the body affected.

Etiology.—Localized edema may be due to anything which interferes locally with the circulation of the scrotum, as enlarged inguinal glands, or more frequently the removal of inguinal glands.

Inflammatory causes play a considerable part in the production of scrotal edema. A number of diseases of the scrotal skin, such as eczema, erysipelas, dermatitis, ivy poisoning, etc., give rise to edema. Edema also occurs in elephantiasis, as a result of a blocking of the lymph channels which characterizes this disease. Disease of the testis may also give rise to some edema of the scrotum, such as acute epididymitis and abscess of the testis; the most marked case that I have seen in connection with the involvement of the testis was associated with tuberculous epididymitis. (See Fig. 863.)

Contusions of the scrotum also cause edema.

Pathology.—The extent of the edema varies. It may be localized in a portion of the scrotum, as in inflammatory edemas associated with acute gonococcal epididymitis.

Destructive inflammations of the glands in the groin, with or without their removal, may be followed by marked edema. The edema in these cases may be of a more or less dense type, or it may be softer. I will mention a few cases of diseases of the scrotum that have been of especial interest to me, though I will not go into them fully.

Illustrative Cases.—*Case I.*—The first was an Italian laborer at the Columbus Hospital, with a history of having had, without any known cause, just before leaving Italy, an attack of swelling and redness of the external genitals lasting for two or three weeks. Shortly after his arrival here, he contracted ch

croid, developing a bubo on one side which broke down and suppurated; the condition becoming chronic, he was operated on. He then again developed an attack of redness and swelling of the scrotum, accompanied by fever. Leaving the hospital apparently well, he again returned some time afterwards with subpreputial venereal sores, phimosis and the same condition of the scrotum. His temperature on this occasion ranged from 100° to 100.5° F. and subsided in about two weeks when he left the hospital. This case was presented at a medical society of dermatology and genito-urinary surgery and was thought to be a beginning sporadic case of elephantiasis with pseudo-erysipelatous attacks.

*Case II.*—The second case was a baker, twenty-four years of age, who had no distinct venereal history. His glands in the groin had begun to swell three weeks before entering the hospital. They were indolent glands, of fair size, and impressed me as being luetic. They caused him considerable discomfort when working. After three weeks of treatment of different internal and external remedies, the glands were less sensitive but not much diminished in size and he asked to be operated upon. I advised him to leave the hospital and go to work. He insisted, and I removed all the glands on the right side and most of them on the left, discontinuing the operation, as he was taking ether badly. One week after the operation his scrotum began to swell and reached the size of a large cocoanut. His wounds healed in two or three weeks, but the edema continued, and it was five months before his scrotum reached the normal size. The edema in this case was plainly due to the removal of the inguinal glands.

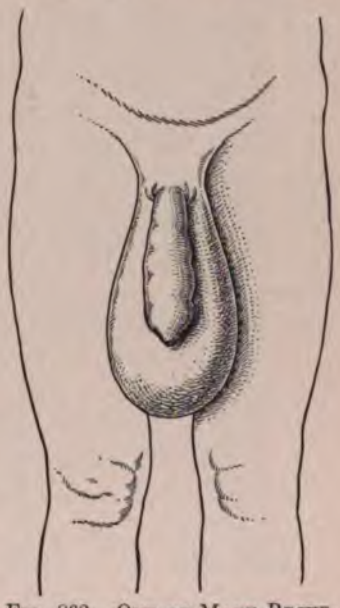


Fig. 862.—One of Many Recurrent Attacks of Edema of the Scrotum Following Removal of the Inguinal Glands.

*Case III.*—The third case was a clerk, thirty-five years of age; he had had inguinal adenitis two years before and his inguinal glands had been removed. There was edema for some time following the operation, which finally subsided. The patient had been in the habit of going on an occasional spree, during which he partook freely of alcoholics, and, renewing the custom after the operation, he found that each spree was followed by an attack of edema of the genitals, lasting for two or three weeks. I saw him at the City Hospital during one of these attacks. His scrotum extended to within two inches of the internal condyle of the femur, and the trough of the prepuce was four inches long (Fig. 862).

*Case IV.*—This case was a patient with tuberculous epididymitis, who developed a white, fairly firm swelling in the scrotum the size of two fists, not

attended by fever. This tumor grew slowly but steadily and was accompanied by no constitutional symptoms. Treatment had no effect upon it, but it disappeared quickly after an orchidectomy. The epididymis was enlarged and adherent to the scrotum (Fig. 863).

FIG. 863.—CASE OF EDEMA ASSOCIATED WITH TUBERCULOUS EPIDIDYMITIS.

**Lymph Scrotum.**—This is due to filariasis from the bite of a mosquito. The scrotum is enlarged, the skin is soft and shows a large number of lymph varices. The inguinal glands on one or both sides are usually involved as well. If one of the varices is pricked, large quantities of milky, straw-colored or sanguineous-appearing lymph will escape, at the rate of half a pint an hour for a number of hours, which rapidly coagulates. Microfilaria can be found in the lymph as well as in the blood. These varices sometimes open spontaneously. Attacks of erysipelatoid inflammation and elephantoid fever frequently occur. In a number of these cases, the scrotum becomes permanently thickened, in time developing into a true elephantiasis.

TREATMENT.—Manson says that "unless inflammation is a frequent occurrence or there be frequent and debilitating lymphorrhagias, or unless the disease is tending to pass into true elephantiasis, lymph scrotum—kept scrupulously clean, powdered, suspended and protected—had better be left alone. Should, however, for this or other reasons, it be deemed expedient to remove the diseased tissues, this can be effected easily."

*Operation.*—Grasp the scrotum and pull it well down. An incision is then made with a small knife well above the diseased tissue, avoiding the testes and cords. The testes should be delivered and all the diseased tissue cut away. No diseased tissue should be left; skin flaps are then taken from the thigh to make a covering for the testes, which are sewed to the healthy tissue. Chyluria or elephantiasis of the leg may follow this operation.

**Elephantiasis.**—Elephantiasis of the scrotum is also a disease due to filaria, the embryonic form of the filaria Bancrofti, in which the scrotum is enlarged.

ETIOLOGY.—It usually occurs in tropical countries and is due to the bite of a mosquito which acts as the host in the transmission of the disease. The filaria lodge in the lymphatics and plug certain of the lymph ducts by their products, resulting in varicosities, dilatations and lymphstasis, showing itself as a solid edema of the parts. Attacks of erysipelatoid inflammation occur in these cases.

PATHOLOGY.—The common size is from ten to twenty pounds. The largest ever recorded was two hundred and twenty-four pounds. The tumor consists

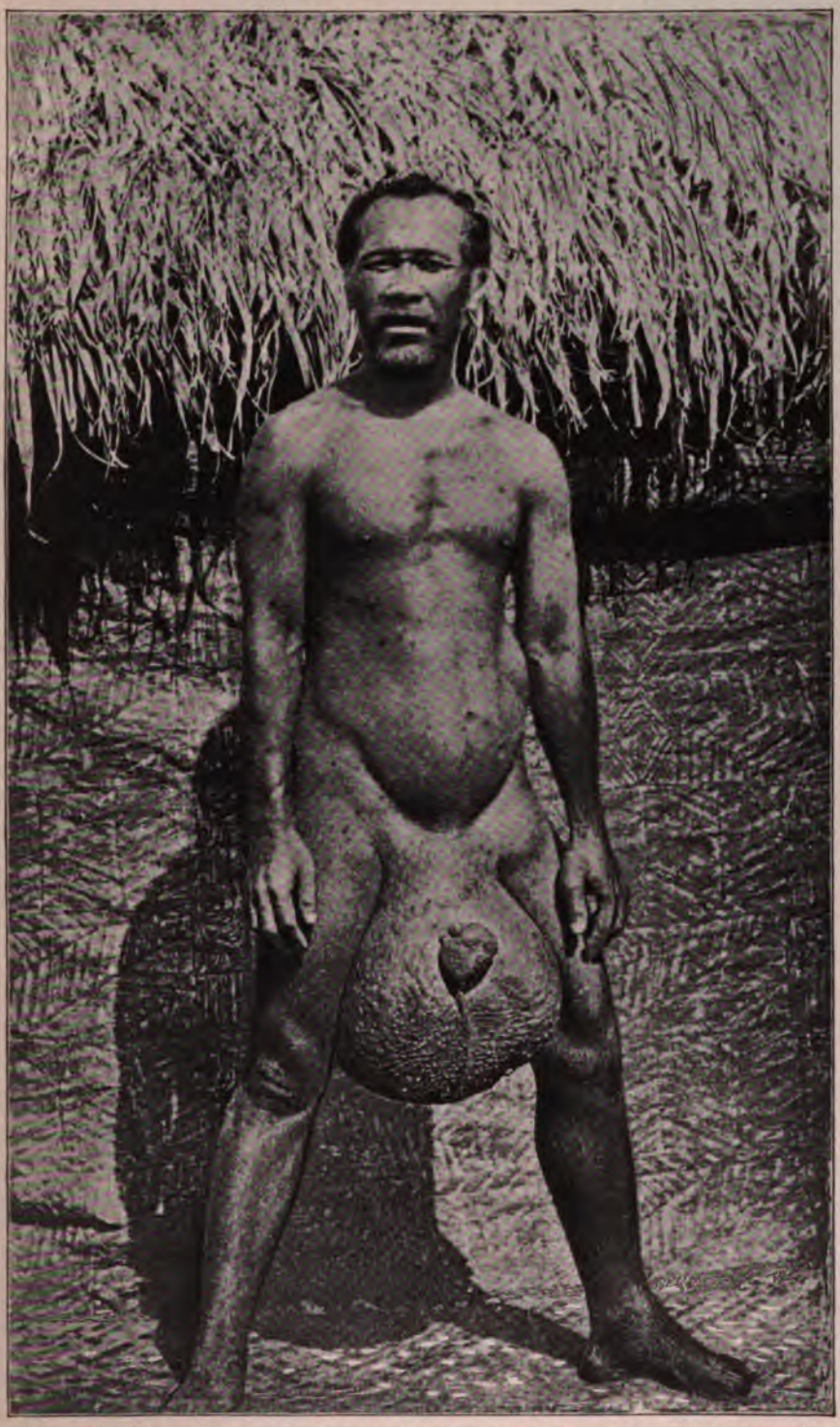


Fig. 864.—Front View of True Elephantiasis of the Scrotum. (From Morrow.)

of two parts—a dense, firm, hard rind (hypertrophied skin), thickest toward the lower part and thinning to meet the healthy skin close to the pubes, perineum and thigh.

Inclosed by this rind is the lax, blubbery, dropsical, friable tissue in which the testes are imbedded.

The shape of the tumor is pyriform, the smaller part being that bounded by the thighs, pubes and perineum. Both testes which are imbedded in the mass are usually associated with hydroceles of large size and thickened tunicas (Fig. 864). The spermatic cords are thickened and much elongated.

FIG. 865.—PSEUDO-ELEPHANTIASIS OF THE SCROTUM. (Author's case, a letter-carrier who had never been South.)

*Pseudo-elephantiasis of the Scrotum.*—I use this name for a condition of the scrotum which resembles true elephantiasis except that no filaria can be found on repeated examination. It usually does not reach a large size and is due to a lymphangitis from other causes.

An illustrative case is that of a patient who was a letter-carrier, twenty-seven years of age, who had always lived in New York and who had never suffered from any disease of his external genitals. About four years ago, following an accident, his scrotum on the left side enlarged in three weeks to the size of a fist. It gradually subsided but did not quite reach normal. It remained in *statu quo* for four years and then gradually began to increase in size until it reached that of a large cocoanut and has remained at this size since then. Repeated examinations have failed to show filaria.

The embryo is a minute transparent, colorless, snakelike organism about $\frac{1}{80}$ of an inch in length and $\frac{1}{3000}$ in width. The parental forms are 3 to 4 inches long and are found in the various lymph tracts and glands. The ova are five times the diameter of the embryo.

SYMPTOMS.—The principal symptoms are the inconvenience of weight, the discomforts of having such a cumbrous mass between the legs, the suffering that attends the recurrent attacks of inflammation and elephantoid fever and the severe disability.

The growth does not, however, endanger life to any great degree. The rapidity of the growth varies. It may reach a large size in one or two

years, or after years of growth there may be simply a slight thickening of the scrotum.

Life is sometimes endangered by a part of the tumor becoming gangrenous or suppurating.

Examination.—The blood is best examined at midnight and it is usually sufficient to prick the finger tip of the patient, make a blood smear and stain with fuchsin. The living filaria can be found by examining a hanging drop under the microscope. Embryos can also be obtained in the evening from diseased areas by hypodermic. The embryos pass from the lymphatics to the blood. A drop of blood may contain 300 to 600 parasites. Examination of the blood may be negative on account of the obstruction of the lymphatics of the affected parts being so great that filaria cannot pass through to enter the blood, or on account of the death of parental forms.

Pseudo-elephantiasis of the scrotum exists when the scrotum appears to be in a condition of elephantiasis and yet no filaria are found and the patient has never been in the tropics.

Treatment.—The tumor should be removed when it becomes unsightly and inconvenient. The elephantoid fever often ceases to recur after the removal of the tumor.

The patient should be kept in bed for two days before the operation, with the scrotum suspended to drain it, which makes it looser and easier to palpate.

*Operation in Elephantiasis.*—The line of incision is marked out in absolutely sound skin. The tumor is turned up, a transverse cut is made across the perineum in front of the anus. The tumor is then lowered and a similar cut made across the pubes; the two ends of these cuts are then united by a straight incision or by semilunar incisions, when there is a little sound skin on the thigh aspects of the tumor. Assistants then pull down the tumor firmly and sometimes a rubber webbing is put about the tumor to squeeze the blood out.

An effort is then made to make the operation as bloodless as possible by winding a strong figure-of-eight rubber bandage around the scrotum as far above the incision as possible, bringing it up over the buttocks behind and over the groin in front and tying it about the waist in such a way as to make firm pressure on the part (Figs. 866 and 867). A vertical incision is then made down the scrotum in front on either side over the testes and cord. The gubernaculum testis on either side is cut through and the testes are drawn out of the incision. An incision is then made through the dorsum of the prepuce and continued up to the pubes. The penis is enucleated from the thick tissue by making an incision through the prepuce behind the corona of the glans. The organ and the testes are then held out of the way and the tumor is cut away close to the pubes and perineum. The vessels are then clamped and ligated, and the tunica vaginalis excised if involved.

If flaps are to be used in covering the scrotum, they can be taken from the sides of the thighs. The posterior halves are first united and then the anterior halves are carried up over the testes and sutured to the healthy tissue or the

Fig. 866.—Figure-of-eight Bandage in Place, Used in the Operation for Elephantiasis.

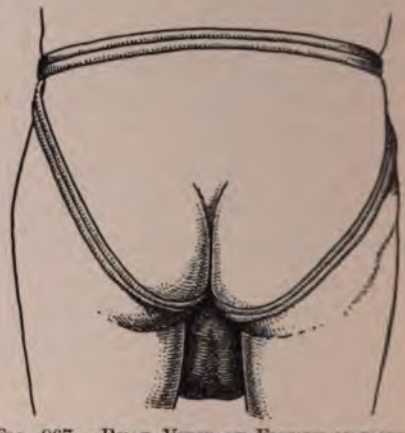


Fig. 867.—Rear View of Figure-of-eight Bandage.

pubes. The base of the organ will then be surrounded by flaps. Flaps from both the thigh and groin already referred to under Extravasation of Urine make the operation easier and give a better result.

In dressing the wound, rubber tissue or some protective should be placed next to the raw surfaces and a heavy gauze compress over this. Skin grafting should later be resorted to, especially about the root and body of the penis.

Fig. 868.

Fig. 869.

Figs. 868 and 869.—Author's Method of Forming a New Scrotum.

The mortality of the operation is not over five per cent; the results are very satisfactory in cases in which well-approximated flaps are made. In cases in which no flaps are made it is astonishing to see how the tissues fill in from the sides and gradually cover the parts.

My own plastic operation for the formation of a new scrotum consists in taking the flaps from the sides of the thigh and the groin.

Technique: The edges of the wound between the thighs should be made perfectly smooth. Two oval flaps, two and one half inches long and one and one half inches wide, are dissected from either side of the suprapubic region and two more of equal size are dissected from either side of the thighs over the adductor muscles (Fig. 868). The two upper flaps are then brought down, covering the testes in front and united by interrupted sutures and the lower flaps are brought up covering the testes behind and united in the same way (Fig. 869). The upper and lower flaps meet and are united at the bottom of the scrotum. The raw surface remaining after the removal of the flaps are covered by approximation sutures passed through their sides.

# CHAPTER LXVII

## HYDROCELE, SPERMATOCELE, HEMATOCELE

### HYDROCELE

Hydrocele is variously classified as periorchitis, orchido-meningitis and vaginalitis.

It consists of a collection of fluid in the tunica vaginalis or the cord.

The tunica vaginalis is a part of the peritoneum which was carried down by the testis in its descent. It is normally closed at the apex of the testis, the beginning of the cord.

Fig. 870.—A Fairly Large Hydrocele. It is irregular in shape, owing to adhesions. (Author's hospital case.)

In adult life, the tunica vaginalis is the sac about the testis, and, like the peritoneum, pericardium and other serous membranes, it has two layers, a parietal and visceral; the former lines the inner wall of the scrotum, and the latter covers the outer surface of the testis. The testis is not in the cavity; it is simply surrounded by this twofold membrane, the space between the two layers being the cavity, and in hydrocele of the tunica vaginalis it contains the fluid (Fig. 870).

**Varieties.**—The different varieties of hydroceles or cysts are known according to the number of their dilatations as unilocular or multilocular. To understand the divisions better it might be well to consider the following table of Jacobson:

*Table from Jacobson*

Hydrocele
- Acute.—A temporary collection of fluid in the tunica vaginalis due to traumatism or inflammation of the testis or epididymis.
- Chronic.—A permanent collection of fluid in the tunica vaginalis or connected with the cord or epididymis.

I. *Chronic Hydrocele of the Testis*

A. HYDROCELE OF TUNICA VAGINALIS. — When the fluid is in the cavity of the tunica or a sac connected with it.

1. Ordinary Type. The fluid distends the tunica vaginalis of the testis.
2. Congenital. When the vaginal process is not closed and there is a communication between the cavity of the tunica vaginalis and that of the peritoneum.
3. Infantile. When the tunica vaginalis and the vaginal process are distended with fluid up beyond the usual point of obliteration, as far as the external ring.
4. Inguinal. Hydrocele in case of a retained testis.

B. ENCYSTED HYDROCELE. —When the fluid is in a sac distinct from the tunica vaginalis.

1. Encysted Hydrocele of Epididymis. The fluid is encysted in or near the epididymis.
2. Encysted Hydrocele of Testis. When fluid is encysted between the tunica albuginea and the visceral surface of the tunica vaginalis.

II. *Chronic Hydrocele of the Cord*

A. DIFFUSE — The fluid forms a serous collection of the nature of edema in the cellular tissue of the cord.

B. ENCYSTED
1. The fluid is in a distinct sac originating in some unobliterated part of the vaginal process.
2. The fluid is in a cyst formed independently of the vaginal process.

III. *Complications:*

(*a*) With Other Coexisting Hydroceles.—*E. g.*, (1) hydrocele of the tunica vaginalis with encysted hydrocele of the testis; (2) hydrocele of the tunica vaginalis with encysted hydrocele of the cord; (3) hydrocele of the tunica vaginalis with diffused hydrocele of the cord.

(*b*) With Hernia.—(1) Hydrocele of the tunica vaginalis with inguinal hernia; (2) hydrocele of the cord with inguinal hernia.

V. *Hydrocele of the Sac of a Hernia.*

ACUTE HYDROCELE.—Acute hydrocele is generally not an important condition, and should not be considered by the reader, as most of the cases calling for treatment are of the chronic variety. It is generally a slight collection of fluid in the tunica vaginalis occurring in cases of inflammation or traumatism of the testis or epididymis. It is of minor importance as compared with the condition to which it is secondary. It also occurs after the injecting of fluids into the tunica vaginalis to cure a chronic hydrocele. Sometimes it is due to an infection in tapping a chronic hydrocele.

*Treatment.*—Acute hydrocele, when it is secondary to other conditions, usually disappears after the primary trouble has been relieved. An infection from tapping would be relieved by washing out the sac afterwards with an antiseptic solution, such as one of bichlorid or carbolic, or else by opening and draining the tunica.

CHRONIC HYDROCELE.—Hydrocele of the Tunica Vaginalis (Ordinary Hydrocele).—*Etiology.*—It is usually due to traumatism of the epididymis or testicle, to tuberculosis, lues or other chronic conditions of the testis or epididymis and in tropical countries to filariasis.

*Pathological Anatomy.*—The walls thicken in proportion to the age of the hydrocele. The layers of the sac consist of connective tissue and are sometimes indurated to the consistence of cartilage, and may even contain calcareous deposits. The ordinary hydrocele contains from two to six ounces of fluid, but large hydroceles may contain a quart (see Fig. 870), and one case has been reported where twenty quarts were present.

The fluid is straw colored, of a specific gravity of 1.020 to 1.028, containing a large amount of albumin. It resembles, at times, clear serum, and may be of a greenish or brownish color, a milky or yellow when due to filaria, while at other times it is opaque or gelatinous. The gelatinous matter also shows itself as a deposit on the parietal layer of the tunica, or between the fibrous and serous layers of the parietal tunica. In these latter cases, it is necessary to break through this coagulum and afterwards the thin membrane separating it from the cavity of the tunica.

The relation between the thickness of the membrane and the amount of fluid in the cavity varies. There may be a large amount of fluid at times with comparatively thin walls, while again the walls may be very thick and the amount of fluid small.

The condition of the walls has given rise to various names under the classification of periorchitis, namely, periorchitis proliferata, periorchitis adhæsiva and periorchitis hemorrhagica.

Periorchitis proliferata is a very much thickened tunica. It has an irregular surface with perhaps projections resembling synovial villi which l[illegible] hardened with time, sometimes going on to calcareous degeneration, especi[illegible] in old men.

Periorchitis adhæsiva is a name given to a condition in which the surface endothelium is destroyed, and an exudate takes place on the tunica which, if both surfaces are attacked, gives rise to adhesions causing the tunica to grow together in places, or throughout its entire extent, obliterating the cavity.

Periorchitis hemorrhagica is a condition in which the surface of the tunica is covered by a newly formed, highly vascular membrane, which bleeds spontaneously at times, thickening and darkening the hydrocele fluid, and producing a condition often spoken of as chronic hematocele.

A suppurative inflammation, periorchitis suppurativa, or empyema of the tunica may also take place.

**Symptoms of Hydrocele.**—(1) The tumor is oval or pyramidal. Occasionally there is pain in the testis or a dragging pain in the cord, especially if it follows the acute form.

(2) Fluctuation is most pronounced in the early stages; but when the tension is great or the walls thickened, it cannot be detected.

(3) The tumor may be irregular in *shape* if adhesions have formed. The testis is usually behind and is harder than the rest of the tumor. It may be drawn to any part of the scrotum by adhesions, or the testis and epididymis may be separated by them. In the translucency test, the position of the testis can usually be made out.

The translucency test should be performed in a dark room. A lighted match or candle is held on one side of the tumor, while the surgeon looks through a roll of paper or any other cylinder with its end applied to the scrotum on the other side. If there is blood present, or the walls are very thick, the tumor may not be translucent. In the clinic, I generally use an electric bulb with back reflector, holding it in such a way that the students can see the golden translucence from the benches. The hypodermic needle inserted into the sac generally confirms the diagnosis by drawing out a specimen of the fluid, and, if the needle is clean, can do no harm even if it should penetrate the testicle.

In periorchitis proliferata, the condition often resembles a solid tumor. In *the suppurative form,* the symptoms of acute inflammation are present, together with redness, and softening of the wall can be felt where the abscess tends to point. Suppuration often causes the destruction of the sac and sometimes of the testis as well. I do not remember ever having seen a case in which there was a suppurative condition before operation.

Hydrocele pursues a chronic course and continues to increase gradually in size. Rupture of the hydrocele tumor may occur, especially in riders, resulting in the escape of the fluid into the cellular tissue with a consequent absorption.

**Diagnosis of Hydrocele.**—Hydrocele must be differentiated from hernia, abscess, spermatocele, hematocele and tumor of the testis.

The presence of lues would be indicated by an enlargement of the testis

symmetrically, with or without a hydrocele, yielding to luetic treatment in a patient with a luetic history and showing a Wassermann reaction.

The presence of tuberculosis would be indicated by nodules on the epididymis in a patient with a family or personal tuberculous history. In case hydrocele is present, the nodules can be felt either through the fluid or after withdrawing it.

Lues and tuberculosis of the testis or epididymis are frequent causes of hydrocele.

Congenital hydrocele is due to a failure of the vaginal process to become obliterated and a consequent communication between the tunica vaginalis and the peritoneal cavity. In this condition, the tumor is more elongated and feels fuller at the external ring. The tumor can be reduced by pressure and by lying down. As development goes on, it very often disappears spontaneously or becomes an encysted hydrocele.

Fig. 871.—Hydrocele of the Cord. (From Taylor.)

Infantile hydrocele exists when the funicular process is obliterated down to some point, usually the external ring, below which point fluid is contained in the vaginal process as well as in the tunica vaginalis.

Encysted Hydrocele. — There are two forms of encysted hydrocele, one of the epididymis and the other of the testis, as before mentioned.

Encysted hydrocele of the cord is an accumulation of fluid in an unobliterated portion of the vaginal process. There may be acute exacerbations, if this is due to traumatism, or other causes, when it is necessary to differentiate it from an incarcerated hernia. This can be done by passing the finger up

through the loose folds of the scrotum, when encysted hydrocele can be easily outlined, while an incarcerated hernia will be found as a thick mass.

Encysted hydrocele of the cord usually shows as an oblong or ovoid tumor, situated between the external ring and the testis, usually in front of the cord, of the size of a small bird's egg, with a smooth and regular exterior (Fig. 871). It can often be removed *in toto*. (See Fig. 872.) It may also be mistaken for a spermatocele, but an examination of the fluid alone can distinguish it through the presence of spermatozoa.

Fig. 872.—A Hydrocele or Cyst of the Cord. Actual size, removed during a hernia operation. (Author's case.)

Diffuse hydrocele of the cord is really an edema of the cord. It shows itself as a sausage-shaped tumor and is thought to be due to the rupture of cysts about the cord.

It resembles omental hernia, as it is thick, nodular, uneven, when the patient is standing but decreases in size when he lies down. It cannot be replaced in the abdominal cavity; but it is apparently reduced, due to the fluid being pushed up into the subperitoneal or intramuscular tissue. It reappears, however, on relaxing the pressure. It exerts considerable pressure on the cord.

Bilocular hydrocele is an hourglass tumor, one part being the distended tunica vaginalis, the other part the distended vaginal process. These two parts are connected by a narrow passage. The upper part is in the subserous space outside the peritoneum. This may be due to traumatism, or it may be simply a deviation of the tunica vaginalis. When the patient lies down, even when no pressure is made, the contents of the lower part disappear into the upper.

Multilocular Hydrocele.—In this condition there are several cysts between the layers of the tunica vaginalis due to inflammatory adhesions. They contain a watery fluid. They feel like conglomerate nodules. Besides this, one occasionally sees on opening the tunica vaginalis numerous little cysts resembling small blisters on its inner surface varying in size from a pin head to a French pea. These have thin walls and break easily, and cannot be detected on external examination.

**Complications.**—Most of them are found with hernia, with affections of the epididymis and testicle, or with other forms of hydrocele.

**Treatment of All Forms.**—The treatment of chronic hydrocele of the testicle and cord in the ordinary form—the infantile, the inguinal, the encysted—whether single, bilocular or multilocular, should be the same, the various methods being used in proportion to the severity of the case. In diffuse hydrocele of the cord and congested hydrocele, the treatment should be more conservative, and should be considered separately.

The various methods of treatment are:

ACUTE.—If associated with great tenderness, local palliative measures as lotio plumbi et opii, ung. ichthyol fifty per cent or poultices can be employed. Such a condition is rarely seen alone.

If it is associated with some inflammation of the testis or epididymis following traumatism or disease, as it usually is, the method used in the cure of these diseases will benefit the hydrocele, and the disappearance of the trouble may be followed by that of hydrocele.

CHRONIC.—Internal treatment, local applications, puncture (aspiration) injection method. Open operation (Volkman's). Excision of tunica. Turning the parietal layer inside out (Jaboulet's method).

*Medical Treatment and Local Applications.*—In young children, hydroceles can sometimes be cured by giving internally potassium iodid and acetate of potassium to increase the circulation and to stimulate absorption, and locally the application of counterirritants, as tincture of iodin. When at one time I had a surgical service in a children's hospital I was surprised at its efficacy, but attributed it mainly to the local action of the iodin. This treatment is, however, absolutely useless in adults.

*Puncture.*—Puncture, simply tapping with a trocar and letting the fluid out, is now rarely used as a curative measure, as it simply empties the sac which later slowly fills again. Patients have been cured in this way, although it is now considered more of a palliative measure and is generally employed together with injections into the tunica.

*Puncture and Injection Method.*—This consists of puncture plus the intratunical injection which gives rise to an adhesive inflammation that unites the two layers of the tunica vaginalis and thus obliterates its cavity. The two injection materials now used are tincture of iodin and carbolic acid. Of these materials tincture of iodin was for a long time the popular remedy, but it gave rise to such a violent, painful reaction and so often to unsuccessful results, that it has been replaced by the pure carbolic which gives rise to far less pain and better results.

The steps of this procedure are as follows: Prepare the scrotum as if for operation; grasp the tumor from behind in such a way that the testicle will be in the hand, and the remainder of the tumor will be made tense. Select an area in the lower third of the scrotum anteriorly between the blood vessels, and thrust in the stilet and cannula. Withdraw the stilet and allow the fluid to escape. Up to this point the operation has been similar to that of simple puncture. When the fluid has all escaped, take a hypodermic syringe with pure carbolic solution (from five to twenty drops; ten drops is usually sufficient) and inject it through the cannula into the cavity of the tunica. We know that it is injected into the tunica, as it is inserted through the same cannula out of which the hydrocele fluid has escaped. Take out the cannula, hold-

ing around it a piece of cotton soaked in alcohol to prevent cauterization of the scrotum. Manipulate the scrotum and testis well, in order to bring the carbolic in contact with all parts of the cavity of the tunica rather than to have it remain in its concentrated strength at the point of the injection, and then put a piece of surgical plaster over the opening.

An acute adhesive inflammation of the two layers of the sac then takes place, accompanied by some pain and discomfort and by considerable thickening of the tissue lasting for two to three weeks, which gradually subsides, leaving the two surfaces of the tunica united and its cavity obliterated. The strong irritant has caused a fibrous effusion which undergoes organization, obliterating the cavity of the sac.

*Operation by Incision.*—This is often spoken of as Volkman's operation, as he was the first to describe it. It consists in opening the tunica vaginalis by an incision through the scrotum, sewing the parietal layer of the tunica to the skin and then inserting drains into its cavity. In this way the infiltration of the fluid into the cellular tissue between the dartos and the tunica is avoided. The drains consist of two small drainage tubes with gauze packed about them. These can be removed in twenty-four to thirty-six hours.

Some advise treating the cavity like an open wound, packing it every day and allowing it to granulate up gradually. I do not consider this a good operation, and have seen patients treated in this way lie for weeks in the hospital before the wound was closed.

*Excision.*—Excision of the sac is another method of treating hydrocele. A long incision is made through the scrotum and tunica and a large semilunar piece of the parietal layer of the sac is then removed from either side almost to the epididymis. The wound may then be closed or kept open and drained.

The latter is not a good method and is performed only by those who are too radical, and it is followed by a long period of suppuration.

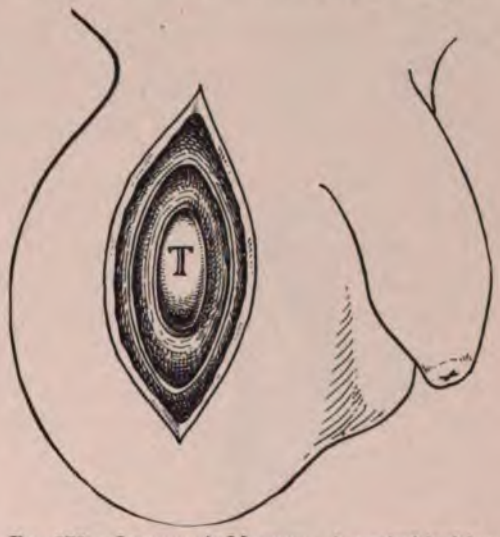



FIG. 873.—JABOULET'S METHOD. A vertical incision is made over the front of the scrotum down to the tunica vaginalis.

*Jaboulet's Method.*—This consists in splitting the sac in front, turning it inside out and stitching it behind the testis so that the serous layer comes in contact with the connective tissue of the scrotum. It is the best method.

The technique is as follows: General anesthesia or inject the scrotum with

cocain or eucain by the infiltration method; make a vertical incision through the scrotum to the tunica vaginalis (Fig. 873). Open the tunica, allow the fluid to escape, grasp it on either side with artery forceps; wipe the outside tissues away with gauze, at the same time delivering the testis and the tunica from the scrotal sac (Fig. 874). Then fold the tunica vaginalis back of the testis on either side, cut away the redundancy of tunica (Fig. 875) and suture with No. 1 chromic gut the two cut margins that formerly were in front of the testis in a corresponding position behind it (Fig. 876), thus obliterating the sac. The testis is then put back in the scrotum again and the vertical incision is closed.

Fig. 874.—Jaboulet's Method. Shows the testis delivered in its tunica vaginalis.

Wyllis Andrews of Chicago has a very good and simple operation which bids fair to supersede the Jaboulet in popularity. He frees the tunica vaginalis in the same way and then makes a small incision in front of the tunica near its neck, pushes the testis through it, thus leaving the testis without a parietal layer of tunica, in which condition it remains. It thus corresponds in its purpose to the Jaboulet method. The testis is then returned to the scrotum and the wound closed.

Fig. 875.—Jaboulet's Method. The tunica is reflected back of the testis on either side and the redundance cut away.

Fig. 876.—Jaboulet's Method. Showing the two cut margins formerly in front of the testis sewed behind the testis, thus obliterating the sac.

The best methods of operating on hydroceles of the tunica vaginalis are by the Jaboulet and Andrews methods, the former of which I have generally used. The next best method is by the injection of ninety-five-per-cent carbolic into the sac of the tunica after the method of Coley. The injection method with iodin or carbolic can be used in all cases excepting the congenital.

In congenital hydrocele, if the case is seen quickly enough, ordinary compression may cure it. As the cases are, however, generally seen at a later date, about all that can be done is to draw off the fluid with a fine needle and then keep well-regulated pressure over the inguinal canal. The best radical method is to cut down to the vaginal process, dissect it up and ligate it just above the testis, thus making a tunica vaginalis, and then to place another purse string about it near the internal ring and finish the operation as after the Bassini operation for hernia.

Encysted hydrocele of the cord can be injected with carbolic, opened and swabbed out with carbolic and alcohol or dissected out and ligated off and removed. Fig. 872 represents an encysted hydrocele removed by dissection during a hernia operation at the Columbus Hospital and presented before the genito-urinary section of the Academy of Medicine. In case of inguinal hydrocele with undescended testis, bring down the testis into the scrotum if it is healthy; but if atrophied, remove both the testis and the hydrocele. If hernia is present, do a Bassini operation.

In case of hernia in connection with hydrocele in the tunica vaginalis, the hernia shows itself as a nontranslucent body in the front part of the scrotum.

## SPERMATOCELE

Spermatocele is a cyst usually situated between the testis and the epididymis in the vicinity of the globus major, containing spermatic elements. It is caused by dilatation of one of the vasa efferentia before it enters the epididymis. It occurs in adults. It may vary in size from a pea to a cocoanut. They have been seen to contain a quart of fluid, but they are generally about the size of a small bird's egg. The base is always above, the apex below. The testis and epididymis can be felt on the sides of the cyst and are not surrounded by the fluid as in the case of hydrocele. Furthermore, the fluid drawn off by the needle shows that spermatozoa are present. The cure is the same as in cases of hydrocele—treated by injections or the sac may be opened and swabbed out with carbolic followed by alcohol.

## HEMATOCELE

Hematocele consists of a collection of bloody fluid in the tunica vaginalis.

**Etiology.**—Hematocele may be due to an injury of the scrotum and tunica by any sharp weapon, as in tapping a hydrocele; to a bad contusion of the scrotum; or to an injury of the testis.

**Pathology.**—The tunica vaginalis changes and varies from a thickened collapsible sac to one that is thickened and not collapsible, the latter variety of which may contain areas of calcareous deposit. A false membrane may be present and also a gelatinous mass, amber or brown in color. The testis may be atrophied to a marked degree. The latter cases, that have undergone so much thickening of the wall of the tunica and atrophy of the testis, usually occur in middle-aged men.

**Symptoms.**—In an acute case which depends on an injury to a healthy or diseased testis or to the scrotum, there may be a sudden hemorrhage into the tunica vaginalis. In such a case, there is sometimes a feeling of pain accompanied by nausea, vomiting and shock. The scrotum becomes generally swollen, red, edematous and impervious to light.

The chronic cases are, however, principally under consideration. They may be the result of an acute case or they may develop slowly after a mild injury which did not make much of an impression upon the patient at the time. In these cases the scrotum enlarges slowly and it may be some days or weeks before the patient calls upon the physician. The scrotum then contains a painless tumor, more or less oval in shape, heavy and giving rise perhaps to a dragging feeling. It is smaller above than below, but does not enter the inguinal canal and consequently the cord above it may be felt. It sometimes feels hard as if it were a tumor of the testis.

**Diagnosis.**—Most cases of hematocele resemble hydrocele and are taken for it, and it is only when the tumor is examined for translucency and found to be impervious to light that hematocele is thought of; this is because hydrocele usually has the same outward appearance and feel and is much more common. It may also be mistaken for an enlarged luetic testis or a tumor of the testis. Both of these conditions are impervious to light unless there is some hydrocele fluid present. A needle should be inserted and any fluid present withdrawn. If an enlargement of the testis still exists after the removal of the fluid in the sac, it will probably be due to one of these conditions. If the former, a Wassermann test will give a positive reaction and it will respond to luetic treatment. In the case of a tumor of the testis, there will probably be a family history of malignancy, or the patient may show some cachexia; but if doubtful, an exploratory incision should be made and the condition investigated. Cases of suspected hematocele are those in which the tumor is impervious to light and in which the mass remains the same after the withdrawal of quite an amount of fluid of a port-wine color. They are probably hematoceles with hard, non-collapsible walls. It must not be forgotten that a tuberculous testis of large size may be accompanied by hematocele, and on one occasion I operated on a traumatic hematocele of two years' standing and found a large tuberculous testis.

**Treatment.**—In acute cases in which it is a question whether or not the testis is involved, it is well to open the sac and, if due to an injury of the testis,

to repair or remove it according to its degree; then to wash the wound out with bichlorid solution or peroxid, and close it. In acute cases in which there are no symptoms of testicular involvement, cold applications or lead-and-opium wash can be applied.

In old cases the sac should be opened, washed out and everted, if its wall is thin; if it is thick-walled, the sac may be cut away and the testis as well in case it is atrophied.

# CHAPTER LXVIII

## THE TESTICLE AND EPIDIDYMIS

## ANOMALIES OF THE TESTIS

THERE are four varieties of anomalies of the testis:

Anomalies in development;
Anomalies in nutrition;
Anomalies in migration;
Anomalies in the adnexa.

### ANOMALIES IN DEVELOPMENT

Anomalies in development are of three kinds: Polyorchism, anorchism and synorchism.

**Polyorchism.**—Polyorchism means a supernumerary testis, that is, more than two in number. We hear occasionally of a man having more than two testes. There are, however, no authentic cases on record of such a condition, although it is not impossible, as it has been observed in the lower animals. In man, even in cases in which the penis has been double, there have been no authentic reports of supernumerary testes. The pathological conditions most frequently mistaken for supernumerary testes are spermatocele, encysted hydrocele, irreducible omental hernia and fibrous and fatty tumors of the cord or tunica vaginalis. I have had all of these varieties sent to me as supernumerary testes and operated upon them, showing the true pathological condition.

**Anorchism.**—Anorchism, that is, the absence of one or both testes, has been occasionally reported. When one is absent, it is called unilateral; when both are absent, bilateral. Gruber reported thirty-one cases of congenital anorchism, twenty-three of which were unilateral and eight bilateral. The testis was never absent alone in the bilateral variety and rarely in the unilateral, as usually the whole or a part of the epididymis and the vas deferens were also absent. There are three varieties: Absence of the testis alone, which condition is never bilateral; absence of the testis, the epididymis and a part of the vas deferens, the common type of anorchism, in which case the seminal vesicle may or may not be atrophied; absence of the entire seminal apparatus, a very rare condition of which there are but two cases on record.

**Synorchism** (Fusion).—This anomaly is very rare and there are but few cases on record. In these cases, the testes are fused together. In one case in which they were fused in the median line of the abdominal cavity, the kidneys and suprarenal capsules presented the same anomaly.

## Anomalies of Nutrition

Anomalies of nutrition are hypertrophy and atrophy.

**Hypertrophy of the Testis.**—This can be determined only by knowing the average size and weight of the organ. The testis, according to Henley, measures 4 to 5 cm. in length, 2 to 3 cm. in the transverse diameter and 2.5 to 3.5 cm. in the sagittal plane. It weighs from 4 to 6½ drachms. Curling considered a testicle weighing 8 drachms as hypertrophied and 3 drachms as atrophied. It is never congenital and never results from sexual overindulgence; but one may hypertrophy when the other organ has been removed, or is not up to the standard from whatsoever cause.

**Atrophy of the Testis.**—This is a much more serious condition. It may be congenital or acquired.

Etiology.—A *congenital* atrophy is due to a deficiency in development of the genital mass. It is generally found in retained or ectopic testes.

The *acquired* form may be due to local, distant or general causes. The principal local causes are acute and chronic inflammation or traumatism, and the principal general causes are the metastatic diseases, as mumps or typhoid; also tuberculosis and syphilis.

Pressure may also cause atrophy, as by a thick-walled hydrocele, hematocele or hernia. I have two cases of pressure atrophy in mind as I am writing this chapter, one in which a very much atrophied testis was found in an old incarcerated hernia, containing a very large mass of closely packed omentum, and another following operation. Elephantiasis of the scrotum is another cause. I am inclined to believe that many cases of hernia are followed by atrophy of the testis, but that not much attention is paid to it at the time. I also believe that, if the fascias are too closely united at the time of a hernia operation, atrophy may take place later; but that this is not considered, as the object of the examination is to see if the hernia itself has been successfully cured. The traumatism incidental to separating the sac from the cord should also be sufficient cause, in some cases, for interference with the circulation and atrophy. Injuries to the spine or the cerebellum, paraplegia, old age, wasting diseases and interference with the circulation are all given as causes of testicular atrophy.

In varicocele, the circulation is interfered with in the testis and there is a stasis in the veins of the cord, giving rise occasionally to atrophy which is sometimes very marked in that the testis may be only one third of its normal

size. And yet marked atrophy is not common in varicocele, but when present, it is usually associated with nervousness (neurasthenia). I remember two patients who visited the office the same morning. Both were despondent; one because he thought his testis was diminishing in size on account of the varicocele and the consequent poor circulation; the other because he thought that his testis was increasing in size from the same cause. And yet in both cases the testes were normal. In varicocele operations, all the tissues of the cord, except the vas, with its artery and vein, can be ligated, and yet it is rare that atrophy follows. On the other hand, the testis may not only atrophy, but it may become gangrenous. I will cite such a case under varicocele. It was proved by Sir Astley Cooper and other surgeons interested in this line of surgery that ligating the spermatic artery does produce atrophy in animals.

Pathology.—In cases of an atrophic testis, examination shows it to be small and glistening, with hypertrophied stroma, dilated blood vessels, diminished lumen of the tubules, although their walls are thickened. The stroma gradually shrinks, producing sclerotic conditions.

Diagnosis.—The diagnosis of atrophic testis depends on its small size and the change in its characteristic feel. In bilateral cases, sterility is present, the sexual desire is weak or absent and no spermatozoa are present. In unilateral cases, it is diminished in size, but healthy spermatozoa and sexual desire are present.

Prognosis.—The worst cases of atrophy, as far as the prognosis is concerned, are those in which an inflammation has followed an injury, and those occurring in the tertiary stage of syphilis. When actual sclerosis has begun, there is no cure. If, on the other hand, it has been due to arrest of function and inadequate nutrition, there is some hope of recovery, as is also the case if the cause is such that it can be removed by medical or surgical means.

## Anomalies of Migration

Under the heading of Anomalies of Migration, we have (1) retention of the testis at some point in the normal course of its descent; (2) ectopia, retention at some point outside of its course of normal descent; and (3) inversion, when it is in the scrotum.

**Retention.**—Etiology.—The causes of this condition are but little known. The theories are that it is due to peritoneal adhesions in the fetus; to the small size of the internal ring; to the incomplete development or the obliteration of the inguinal canal; to the misplacement of the attachments of gubernaculum testis, or the absence of one or more of its fasciculi; to the shortness and incomplete development of the vas deferens or the vessels of the cord preventing its descent; to an abnormally large epididymis; to the presence of an abnormally long mesorchium which keeps the testis swinging in such a way as to prevent

it from engaging in the entrance of the inguinal canal; to the testis lying transversely in such a way as to render entrance into the internal ring impossible; to pressure on the testis by a truss worn in cases in which the testis is mistaken for hernia in an infant, or in which hernia exists in front of a retained testis, that tends to keep the testis up or pushed back. My own views are that it is rarely owing to the shortness of the vas, in fact, I have never seen such a case; but rather to a mesorchium which is abnormally short, or, on the other hand, so long that it tends to prevent the testis from entering the inguinal canal, together with some narrowing of the ring or the canal, or some abnormality of the gubernaculum testis.

A mesorchium which is too long at the time when the testis should have descended may not develop to any great degree in childhood and youth and consequently at operation it may be found to be one of the greatest impediments in drawing down the orchid.

The next important impediment is usually the shortness of the vessels of the cord.

Varieties.—The different forms of retention are the abdominal, the iliac, the inguinal, the cruro-scrotal and the transitional. Of these the inguinal and the cruro-scrotal are the most common forms.

*Abdominal Retention.*—In this form, the testis is situated in the abdominal cavity, either in a fixed position in the vicinity of the kidney, or more or less free in the abdominal cavity, and it is attached to the posterior wall of the abdomen by a narrow fold of peritoneum, called the mesorchium, upon the length of which depends the amount of freedom that the testicle enjoys. In normal cases, it should be just long enough to enable the testis to enter the internal ring. It is diagnosticated by the absence of the testis in the scrotum or the inguinal canal, and a peculiar localized testicular sensitiveness somewhere in the abdominal cavity. I will here report a case of double bilateral retention that I had, in which there was no scrotum present. The patient was a medical student who was extremely neurasthenic and applied for operation. His testes could be detected as points having what he considered the testicular sensation, just below his kidneys. He would not consent to an abdominal operation, but desired to have two artificial testes introduced. I operated upon him fifteen years ago, making an incision through the front of the scrotum and inserting an oval mass of well-polished celluloid, the size of a normal testis. I advised him not to have the other put in for a year or more, on account of the lack of space, and after the incision had firmly healed to occasionally pull upon the artificial testis from time to time until it hung loose in the tissues. One year later I saw the patient again. He had entirely changed from a tall, very thin and nervous individual with a twitching face and squeaky voice, to quite a robust man thirty to forty pounds heavier, with a stronger voice and calm facial expression. A scrotum had developed with

rugæ of a darker color than the skin. A few years ago, I put in the second testis.

*Iliac Retention.*—Iliac retention exists when the testis is retained in the iliac fossa near the entrance of the inguinal canal, a very rare condition. I have had two of these cases, one of which I operated upon with success, bringing the testis into the scrotum.

*Inguinal Retention.*—This is the common variety, in which the testis enters and remains in the inguinal canal. It remains near the internal ring, the external ring or between the two rings, in which last case it is called interstitial.

I have had quite a number of cases of this last condition, one of which became malignant. In the position near the internal ring, it is more exposed to injury. A retained testicle in the inguinal canal is frequently mistaken for inguinal and also for crural hernia. It usually moves freely, except when surrounded by adhesions after an inflammatory exudate has formed. The funicular process may remain open down to the scrotum and allow a hernia to descend into the scrotum past the retained testicle. It is a predisposing cause of hernia when open only as far as the testicle, and it is said that an inflammation of the testis may be communicated to the hernia and give rise to fatal peritonitis.

A case following inguinal retention that I had some years ago was even more neurasthenic than the case of abdominal retention. A young Frenchman thirty years of age had had inguinal retention. A French surgeon had operated him and brought down the testis. This had later retracted, causing him pain and discomfort, so that it was removed by castration. He then became engaged to be married, but the girl, finding that he had but one testis, refused to marry him unless he had another put in. He applied for a testis at the French hospital and a celluloid oval was introduced. This satisfied the girl, whom he placated by telling her that it was from a young bull. He was married and his neurasthenia was cured. Melancholia occasionally occurs in men with retained testicle.

*Cruro-Scrotal Retention.*—This is also a common variety, frequently mistaken for an inguinal hernia, in which the testis is found in the cruro-scrotal region, in front of and below the external inguinal ring. This type is also quite frequently accompanied by hernia.

*Transitional Retention.*—This occurs in cases in which the testis is partly in one position and partly in another, and is so mobile that it may wander from one position to the other.

Since writing this section on Retention of the Testis, I have had a remarkable experience. At one of my clinics I had seven new patients, and, according to my custom, I see all the new cases first and reserve those of interest for the lecture. The first patient presenting himself had only a right testis in the scrotum, which was the cause of a neurasthenic condition, as his wife attributed a childless marriage to his seeming deformity. Examination showed

a left testis in the iliac region, where it was detected by the testicular feel on palpation. The next patient entering the lecture room complained of a urethral discharge, and, on examining him, I found that he also had but one testis in the scrotum, the left one, whereas the right one was detected in the abdomen by palpation. The second patient was not at all worried about his condition and had known for a long time of the presence of the testis just to one side of the umbilicus. The clinic is a very large one and notwithstanding that I have been in attendance for over twelve years, on this particular evening, with a minimum number of new patients, two had attended, one with abdominal and another with iliac retention; and yet in the history of the clinic, although about 30,000 patients had applied for treatment, it was the first time that patients with either of these forms of retention had presented themselves.

**Ectopia of the Testis.**—Ectopia is a condition in which the testis has been arrested at some point outside of its normal course of descent. The three varieties are: (1) Perineal, (2) crural and (3) pubo-penile.

Varieties.—*Perineal Ectopia.*—This comprises all cases in which a testis is found under the superficial fascia of the perineum. It is really a continuation of a crural scrotal retention, the testis simply having traveled farther downward and backward. It is said to be the most common of the three forms, although I have never had such a case. The testis is usually situated in front and to one side of the anus and is freely movable. A tunica vaginalis is usually present. There are no rugæ in the overlying skin, and there is no dartos in this region. It is subject to traumatism and inflammation on account of its exposed position. The diagnosis depends upon the absence of the testis on that side of the scrotum, and the discovery of a cord that can be traced from the inguinal region to the perineum, at which point is found a well-defined mass having the testicular feel. An inflamed testis in this position is sometimes mistaken for a perineal abscess and *vice versa*, and I remember when an interne having been instructed to treat a periurethral perineal abscess following a urethral divulsion as a case of retained testicle until the abscess fluctuated and was opened. It is supposed to be due to a faulty attachment of the gubernaculum testis, the middle bundle of which is attached to the superficial fascia of the perineum, instead of being attached to the scrotum (Fig. 877).

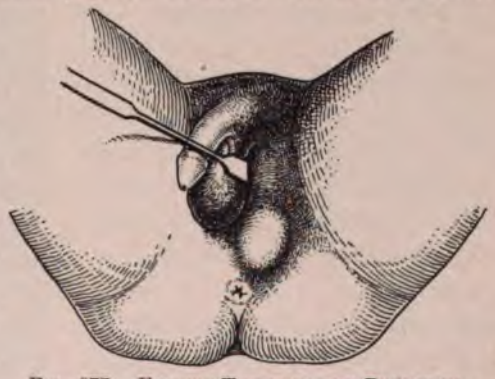


Fig. 877.—Ectopic Testis in the Perineum.

*Crural Ectopia.*—This is a very rare displacement. It has practically the same features that are found in femoral hernia, except that the testicle is

present instead of gut or omentum. This condition is the result of the testis descending through the crural canal instead of through the inguinal. It is, however, frequently associated with hernia, and is sometimes enveloped in a knuckle of gut. When inflammation occurs in a testis in this locality, even without a hernia, the symptoms closely resemble strangulated hernia.

FIG. 878.—CASE OF INGUINAL RETENTION ON THE RIGHT SIDE AND ECTOPY AND HERNIA ON THE FRONT OF THE LEFT THIGH. Note that the retained testis in the right groin cannot be seen, although it can be plainly palpated. (Author's case.)

Crural ectopia is also mistaken for enlarged femoral glands or indolent bubo. The cause of this variety has been subject to much discussion and some authorities say that a crural ectopia is a femoral hernia of the testicle.

I had a very interesting case, some time ago, of inguinal retention on the right side and ectopia of the left testis in the crural region, with omental hernia.

The case was a bootblack, twenty years old. He had never had a testis in his scrotum. On the right nothing had ever been seen, while on the left side there had always been a tumor on the front of his thigh, in a line with the anterior-superior spine, about opposite his pubes (Fig. 878). This has been growing slowly. He very often struck it against some object, resulting in a hard and painful swelling that lasted for some days and interfered with his work.

FIG. 879.—SAME CASE AS IN FIG. 878, SIDE VIEW.

Examination: The tumor was the size of a goose egg, flat on percussion, irreducible,

tender on pressure and seemed to contain fluid (Fig. 879). It had an irregular, nodular feel. On standing up, an impulse was felt deep down on pressure, but it was not so marked when he was lying down, reminding one of a hernia beneath the mass.

Diagnosis: Ectopic testis, displaced outward on the thigh, hydrocele and omental hernia beneath; testis and epididymis probably enlarged.

Operation: An incision was made over the tumor through the integument, and disclosed a thick gray sac. The sac was incised, showing its contents to be a large thickened piece of omentum surrounding a testis, which was one half the normal size. The testis had a cord which led to the inguinal region. There was no inguinal canal, as the external and internal rings were one in the groin, and the cord entered the combined ring, extending over the front of the thigh. The cord was very adherent to the sac and to the omentum and was separated with difficulty. The omentum was ligated and cut off and its stump pushed into the peritoneal cavity, the sac was ligated and anchored above the opening. It was very adherent to the sides of the ring. The cord was placed outside of the combined external and internal oblique muscles and under the skin. The fingers were pushed into the scrotum and it was stretched until it was large enough to hold the testis when the organ was returned to its proper position. The patient refused to have the retained testis in the right groin operated upon.

The case was shown at the New York Academy of Medicine both before and after the operation. After the operation, a peculiar appearance of the tissues remained in that region, resembling a scrotum.

*Pubo-Penile Ectopia.*—This condition is very rare, only two cases having been reported. It is due to the atrophy of the external and middle fasciculi of the gubernaculum testis. The internal fasciculus remains and draws the testicle into the pubo-penile region in the proximal portion of the sheath of the penis.

**Inversion of the Testis.**—In this case, the testis is in the scrotum but inverted, that is, not in the usual position. The varieties are anterior, horizontal, lateral, or the epididymis may form a complete circle about the testis. The cause is unknown. In anterior cases the epididymis is in front. In horizontal cases it lies in the bottom of the scrotum, its long axis horizontal and the epididymis above the testis. The lateral cases have the epididymis facing to one side, that is, turned 90°.

**Anatomical Changes Due to Anomalies of Migration.**—Certain structural changes occur in the organ, resulting in more or less loss of function, due to increasing pressure or inflammation, which are of considerable medico-legal importance in the question of annulling marriage or proving paternity. The testis is at first healthy; then the tubules and stroma begin to show changes, already described under Atrophy. Their functional capacity still exists and they secrete normal seminal fluid as long as the structural changes have not

suffered sufficiently to interfere with this function. Spermatozoa have been found in these cases under the age of thirty-five. Cases of abdominal retention are more favorable, as the testis is protected from injury.

The scrotum on the anomalous side may be well developed in some cases; in other cases, undeveloped. There is usually no dartos nor rugæ.

**Complications.**—The complications of misplaced testis are: (1) Inflammation from pressure and injury, (2) gangrene, (3) peritonitis, (4) hydrocele, (5) hematocele, (6) atrophy, (7) new growths, (8) hernia.

Inflammation.—According to Catalin, inflammation is due first in frequency to injury and second, to gonorrhea. It is most frequent in the inguinal variety.

The symptoms and course of inflammation are usually those of an acute type in the form of recurrent attacks, with pain and swelling on the side in which the scrotum is empty; or it is a prolonged chronic inflammatory condition. The outline of the tumor is clearly defined in inguinal and crural cases. There is tenderness and often colicky pain in the abdomen, nausea and vomiting, sometimes resembling strangulated hernia. The treatment for acute cases is practically the same as that of an inflammation of a testis normally placed, that is, rest, hot applications or ice bag. Later on, the testis should be transplanted if desired.

Gangrene.—Gangrene is a rare complication, but may result from the pressure of inflammatory products in the surrounding tissues or from torsion of the spermatic cord.

Peritonitis is another very rare condition and is due to extension in the case of hernia, or when the funicular process is not closed.

Hydrocele and hematocele may be present in retained testis, the latter being very rare.

Atrophy is a frequent sequela, as has already been mentioned.

Malignancy is quite a common complication, especially of the inguinal form, as the testis is more exposed to injury. Tumors are usually carcinoma or sarcoma, although cystoma and enchondroma have also been found. In these cases, there is the history of a steadily growing tumor accompanied by pain. Examination shows a well-marked enlargement and cachexia. I have had but one case of malignancy, a carcinoma complicating a case of inguinal retention.

The patient lives about two years after the beginning of the growth.

Treatment is castration. In this case, about twenty per cent apparently recover, but the process develops later in the retroperitoneal glands.

Hernia is a fairly frequent complication of retained testis, especially of the inguinal and cruro-scrotal variety. I have also had one of the crural type.

**Treatment of Retained Testicle.**—The treatment of retained testicle consists in replacing it by manipulation, followed by wearing a truss; replacing it by operation; and castration. I have never seen a good result follow replacing

the testis and wearing a truss. Castration is advocated by many after the age of puberty, perhaps on account of the teachings of Kocher that a testis retained in the inguinal region undergoes pathological changes after puberty. I do not agree with the advocates of castration in the treatment of these cases, except in malignant growths, and I believe that in every case of retained testis, except the abdominal variety, an effort should be made to place it in its normal position by operation. I have operated on a number of these cases during the last fifteen years and have had excellent results and no returns showing malignancy. Castration is indicated in all malignant cases.

Technique of Operation.—This should be performed by choice between the ages of eight and ten.

In the *inguinal* and *cruro-scrotal types*, the incision is much the same as for hernia, through the skin and external oblique fascia, opening the inguinal canal and exposing the testis. Any adhesions about the cord and testis are broken up and an effort made by traction to replace the testis in the scrotum. This can sometimes be accomplished in the cruro-scrotal type, and the fascia of the cord is then united by sutures to the external inguinal ring to prevent the testis from again retracting into the canal. I have done this operation a number of times and have had one fairly good result; but there is usually a feeling of discomfort afterwards.

I now operate by cutting through the tissues that hold the testis in its abnormal position. After opening the canal and freeing the testis and cord, I cut through the vaginal process transversely so that it can no longer be a source of traction. I then separate the tissues of the cord and free the vas deferens with its artery and vein from the remainder of the tissues. The vas and its artery and vein are generally looped and with the testis are prevented from being stretched out by some of the other tissues of the cord. Having found the part that is taut, I proceed to cut through it, after which the testis with its vas can be pulled down until the cord is of about the same length as that of the other side. If necessary, all the tissues can be cut through, except the vas with its artery and vein, as is often done in the varicocele operation, care being taken to clamp and ligate the ends of any cut vessels. Two fingers are then pushed from above down into the scrotum of the affected side and it is thoroughly stretched. The testis is then placed in the scrotum and the sides of the incision in the external oblique aponeurosis and skin closed, as after a hernia operation. It is difficult to tell whether or not the fingers go into the right tissue plane of the scrotum, but there does not seem to be any undue pressure on the testis. The newly filled scrotum can be fastened to the inner side of the thigh temporarily to help keep it stretched by passing a suture through either side of it, as well as the cavity that has been made in it, and then passing it through the skin of the thigh or else by fastening the suture to the thigh by a strip of adhesive plaster. It is not advisable to open the scrotum, as urine leak-

ing into the incision through the dressings might, in the poorly nourished condition of the testis, predispose to slough; although, when the operation is performed in the inguinal region, such a wetting of the wound is less liable to occur.

In cases of *iliac* displacement, the same incision in the groin should be made through the fascia of the external oblique, after which it should be continued upward from a point corresponding to the internal ring, through the muscular wall, down to the peritoneum and the testis with the mesorchium is then delivered. The mesorchium should be cut through, which gives greater freedom to the vas deferens and the testis; besides which, any of the other component parts of the mass preventing the full extension of the testis and vas should be cut through and the testis should be drawn down to its full extent, probably to the scrotum. The portion of the mesorchium above the testis should be closed with catgut suture, forming a tunica vaginalis, and the part higher up should be closed in a similar way at the upper part of the incision. The abdominal muscles should be closed carefully in layers down to the seat of the internal ring. The testis and cord are brought down between the fascia of the external oblique and the tissues beneath it which form a new inguinal canal, and the testis is placed in the stretched-out scrotum on that side, as has just been described in the operation for inguinal displacement. The fascia of the external oblique and the skin are then closed, completing the operation.

I have had a large number of cases of inguinal and cruro-scrotal retention of the testis, several of which were combined with hernia, but have operated but one case of iliac retention combined with hernia and another of crural displacement combined with hernia in which the displacement did not come through the crural canal. In the case of iliac retention, there was an inguinal hernia in the groin, but the testis was in the abdominal cavity and an incision of two or three inches had to be made before it and its mesorchium could be delivered. In this case, the mesorchium and all the tissues except the vas deferens with its artery and vein had to be cut through. The hernia was a recent bubonocele but could never have dragged the testis, which was of fair size, through the ring, even if the hernia had descended into the scrotum.

In the case of an *abdominal* retention, the same operation could be performed. A retained abdominal testis is, however, more difficult to find. In malignant tumors of a testis retained in the abdomen, the gland should be removed. Bevan has worked out a very careful technique for the operation on retained testis which I will now speak of.

The technique is as follows: An incision is made about three inches long over the inguinal canal. This cut should divide skin, superficial fascia and the aponeurosis of the external oblique. Under the external oblique will be found a pouch of peritoneum extending from the abdominal peritoneum through the canal and down to the scrotum. Sometimes the pouch extends to the bottom of the scrotum even in cases in which the testicle has never been out of

the abdominal cavity. This pouch of peritoneum is covered by the cremasteric muscle and fascia and the transversalis fascia. These thin layers should be divided and the peritoneal pouch opened (Fig. 880). The vaginal process of peritoneum should be divided transversely well above the testicle. Care should be taken not to injure the cord, and in children, where the peritoneal process is as delicate as tissue paper, the dissection must be made with great care and with small instruments. After complete transverse division of the vaginal process, the upper end is closed with a catgut ligature, as in the sac in a hernia operation, and the lower end is closed with a purse-string suture, making a tunica vaginalis for the testis (Fig. 881). Then, with a gauze sponge, the peritoneum is carefully wiped off from

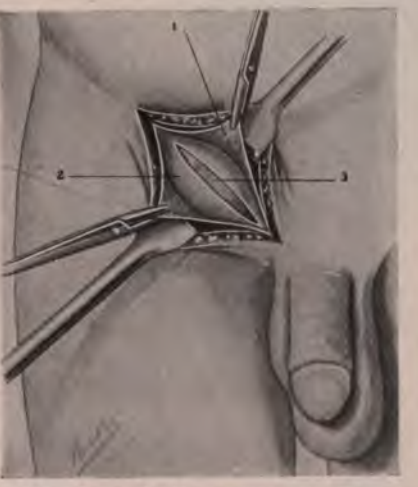



FIG. 880.—BEVAN'S OPERATION FOR RETAINED TESTIS IN THE INGUINAL REGION. Shows the skin, fascia, and aponeurosis of external oblique, cremasteric fascia and peritoneum cut through. (Keen's "Surgery.")

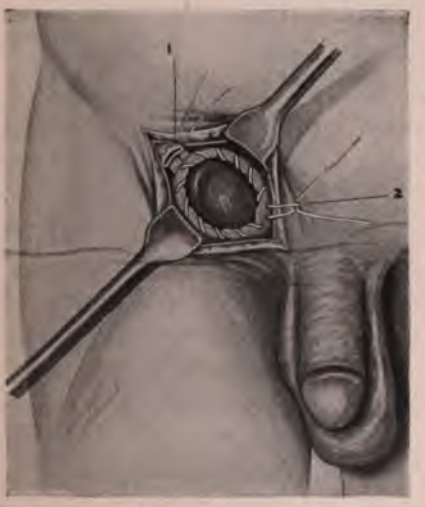



FIG. 881.—BEVAN'S OPERATION FOR RETAINED TESTIS IN THE INGUINAL REGION. Shows the vaginal process divided, the upper segment ligated and the part below with a purse-string suture about it ready to be made into a tunica vaginalis. (Keen's "Surgery.")

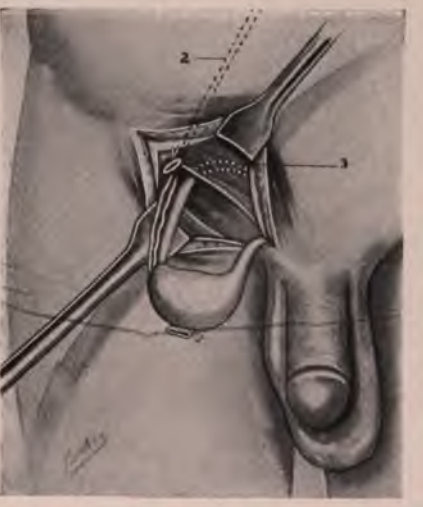



FIG. 882.—BEVAN'S OPERATION FOR RETAINED TESTIS IN THE INGUINAL REGION. Shows the vas freed of all tissues and vessels interfering with its extension except its artery and vein. (Keen's "Surgery.")

the cord. As the wiping proceeds, the cord will gradually lengthen until the testicle can be brought well down upon the thigh. Tense fibrous strands in the

cord are to be torn either with the fingers or blunt dissecting forceps and the cord is to be freed of everything except the vas and its vessels (Fig. 882). When, as in the exceptional case, a large peritoneal pouch extends to the bottom of the scrotum, the testicle can now be pushed into this and retained by a

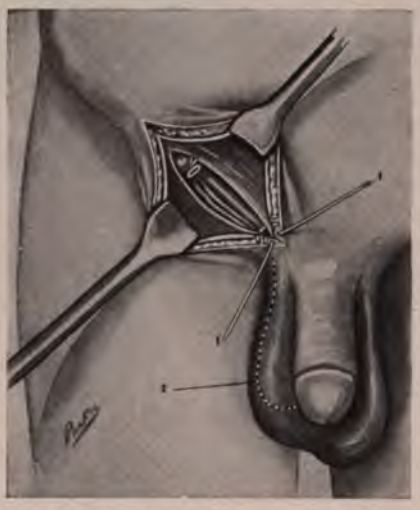


FIG. 883.—BEVAN'S OPERATION FOR RETAINED TESTIS IN THE INGUINAL REGION. Shows the testis in scrotum. (Keen's "Surgery.")

FIG. 884.—BEVAN'S OPERATION FOR RETAINED TESTIS IN THE INGUINAL REGION. Shows the usual way of stretching the scrotum before placing the testis in it. (Keen's "Surgery.")

purse-string suture within the neck of the scrotum (Fig. 883). As a rule, however, it is necessary to make a cavity by blunt dissection with the finger (Fig. 884).

In a few cases—but these will be quite the exception—it is found, even after the free exposure of the cord, that it is not long enough to permit of the reduction well into the scrotum. In such cases it will be seen that the shortened structures are the spermatic artery and veins. These can be divided between two ligatures, care being taken to avoid injury to the vas and the vessels of the vas. It will then be found that the testicle can by gentle traction be brought down sufficiently to replace it in the scrotum without tension. As has already been stated in the discussion of the surgical anatomy of this region, the artery of the vas and the veins of the vas are quite sufficient to supply the entire testicle after the ligation of the spermatic artery and anterior group of veins.

The wound is now closed as in an ordinary hernia operation, not transplanting the cord, as is done in the Bassini operation, but allowing it to remain in its normal position. The success of the operation depends upon freeing the testicle so completely that it can be placed in a roomy pocket well down in the scrotum without tension. Of thirty-four operations, thirty have been completely successful.

*Artificial Testis.*—The operation of inserting an artificial testis made of celluloid seems to appeal to the men suffering from abdominal retention, as there is not so much danger of malignancy when the orchid is in the abdominal cavity as in the other forms and as the insertion of an artificial testis seems to them simple and without danger and gives them the normal external appearance.

### Anomalies of the Adnexa

This embraces those forms of anomalies which may persist in the scrotum, such as the hydatid of Morgagni, a remnant of the Mullerian duct; the organ of Giraldi, a vestige of the Wolffian body; and the vas aberrans of Haller, a vestige of the seminal tubules. Besides this, the inguinal canal may be imperfectly developed. The funicular process may be obliterated low down, or it may remain patent. The scrotum may be absent on one side, poorly developed, or abnormally long.

## INJURIES OF THE TESTIS

There are four kinds of injuries of the testis: (1) Dislocations, (2) contusions, (3) wounds and (4) torsion.

### Luxation of the Testis

The cause of luxation or dislocation of the testicle is usually traumatism, which acts directly upon the organ in such a way as to displace it by squeezing it upward and to one side or the other. These luxations are divided into five varieties: (1) Abdominal, (2) crural, (3) perineal, (4) penile and (5) inguinal.

**Abdominal Form.**—In the abdominal form, the testis is found under the abdominal integument after an accident, as when a man is run over, the wheel of a carriage passing up from between his legs over the abdomen, pushing up the testis and squeezing it beneath the integument over the pubic bones. In such a case, the testis perhaps is not reduced by taxis and may remain in this position indefinitely with no atrophy and no discomfort. It is an exceptionally rare condition.

**Crural Form.**—In the crural type, the testis is found under the skin of the upper and inner part of the thigh just below Poupart's ligament. This may also be brought about by being run over by a wheel.

**Perineal Form.**—The perineal form has been reported but once, in which a mounted soldier was thrown forward with great force, striking his scrotum against the pommel of his saddle and pushing the testis into the perineum.

**Penile Form.**—The penile form is not mentioned in any of the treatises on the subject.

The following case of dislocation of the testis into the penis was referred to me by Dr. Medina of New York City:

The patient, while carting radiators, jumped from his cart, fell and was run over, the wheel passing up between his legs and over his left pubic bone, and the side of the abdomen and thorax, fracturing his ribs and causing a large amount of hemorrhage from the wound in the groin. His external genitals became swollen and black, although he passed urine without difficulty. Later it was noticed that the testis was absent on the left side, although there was a mass in the upper part of the scrotum on that side. I found that the testis was beneath the integument of the penis directly connected with the mass in the upper part of the left scrotum. The testis had evidently been torn from the epididymis and forced through the tissues, whereas the epididymis

Fig. 885.—Luxation of the Testis, Showing the Testis in the Left Side of the Organ, Front View. (Author's case.)

Fig. 886.—Same Case as in Fig. 885, Side View.

had remained in the upper part of the scrotum beneath the dartos sheath. Attempts at reduction under ether failed. Accordingly, an incision was made at the peno-scrotal junction on the left side over the scrotum into the tunica vaginalis, after which the forefinger was inserted through the incision to the testis. It was then possible to break up the adhesions and to draw it from its place of confinement into the tunica vaginalis and close the wound. The recovery was uneventful (Figs. 885 and 886).

**Inguinal Form.**—The inguinal form includes those cases in which the testis is found in the groin near the external ring, or in the inguinal canal, due to traumatism.

In all these varieties of dislocation, the testis is liable to be inflamed, strangulated and followed by atrophy.

**Treatment of Dislocations.**—If the patient is seen immediately after the accident, an effort should be made to replace the organ by manipulation, and, as the pain is usually very great, it is advisable to give an anesthetic. If the testis is not seen for some time after the accident as is usually the case, considerable pain and swelling will be found present, preventing reduction by taxis, both on account of the swelling of the parts through which the testis has passed and also on account of an epididymitis or orchitis which has produced adhesions.

An operation is therefore necessary. The operative procedure consists in a free incision that will expose the testis and cord. The point should then be found at which the organ has escaped from the scrotum; the finger should be introduced into this space and the testis pushed along it to its normal seat.

## Contusions of the Testicle

The causes of contusions are falls and blows in fighting, wrestling, riding and exercising. There are three degrees of injuries due to contusions.

**Degrees of Contusion.**—The first degree is usually accompanied by an effusion of blood into the substance of the testis, called parenchymatous hematocele. This may also be accompanied by hematocele of the tunica vaginalis and even of the spermatic cord.

In the second degree, in addition to the parenchymatous hematocele, the surrounding seminal tubules are lacerated and the blood and the spermatic fluid mix. This may develop into an abscess. This form is usually followed by atrophy.

In the third degree, the lesion is more extensive in that the tunica albuginea is torn through as well, and blood and spermatic fluid may escape into the tunica vaginalis. Following this condition there is always atrophy.

**Symptoms.**—Intense pain, accompanied by dyspnea, nausea, vomiting, dizziness, faintness and all the symptoms of shock. There are ecchymoses of the scrotum and fluid in the tunica vaginalis. The testis becomes more or less swollen in the first degree; in the second and third degrees it is swollen to a greater extent and the scrotum is red. In cases of impending suppuration, there are chills, fever and later fluctuation. Atrophy follows, except in mild cases.

**Treatment.**—For the shock, stimulants, liquor, caffein or strychnin should be given to the patient and later, after he has been put to bed, a hot rectal enema of salt solution. For rapid effusion of blood, cold compresses or ice bags. For pain, morphin and locally lead-and-opium wash. This can be applied cold, as a compress, and is one of the best remedies that can be employed

in these cases. The patient must be kept in bed until the pain has ceased, after which he may be allowed to go about with his testes well supported. If there is a large accumulation of blood about the testis, the tissues can be opened, the clots evacuated and the gland washed with a weak solution of bichlorid, after which wet antiseptic dressings should be applied. If an abscess threatens, it should be poulticed and opened when pus has formed.

### Wounds of the Testis

There are three varieties: Punctured, incised and lacerated wounds.

**Punctured Wounds.**—These are usually the result of tapping a hydrocele and are rarely severe, although in some cases an orchitis may result. The treatment consists of a thorough cleansing of that side of the scrotum followed by a wet dressing of bichlorid, and later, if pain results, one of lead-and-opium wash. The puncture generally heals by primary union.

**Incised Wounds.**—These are usually the result of accident in operation or of injuries in fighting with knives. If they are sufficiently large, they may be accompanied by a prolapse of the seminiferous tubules. In mild cases, the prolapsed portion does not increase in size to any degree and sloughs off. If an orchitis takes place, the prolapsed mass may grow larger and sometimes include a large part of the substance of the testis. In the worst cases, the whole organ may be lost by suppuration and gangrene. The treatment of a case of incised wound is to wash the scrotum immediately with soap and an antiseptic solution, find the prolapse of tubules, wash them with a mild antiseptic solution and afterwards with salt solution, and then push back the prolapsed portion and sew up the tunica albuginea with fine chromic gut. After this, wash out the tunica with antiseptic solution and apply externally a wet dressing of bichlorid after closing the wound. If, when first seen, the prolapsed portion is beginning to slough, it can be cauterized down to the level of the tunica albuginea and then treated antiseptically as above described without uniting the tunica albuginea.

**Lacerated Wounds.**—These are usually the result of gunshot injuries and are therefore more liable to infection and gangrene. They may result in hematoma as well as prolapse and sloughing of a portion of the testicular tissue. These wounds are rare. Whenever evidences of gangrene are present, castration is advisable. The testis should be supported by a suspensory bandage after all injuries. This is composed of a layer of gauze, over which is one of cotton batting and outside of this a bandage which supports and protects the testes. (See supports under Inflammation of the Testes and Epididymis.)

### Torsion of the Testis

Torsion is due to a twist of the cord and, although it really belongs to funicular diseases, it is considered under Diseases of the Testis (Fig. 887). Chronic partial torsion is frequently seen and gives rise to slight or no symptoms. Acute torsion is most frequent in incompletely descended testis. The traction of the gubernaculum seems to favor torsion. If the condition is not soon relieved, the blood supply to the organ is interfered with, causing strangulation.

Fig. 887.—Torsion of the Testis. (From Keen's "Surgery.")

The symptoms resemble those of strangulated hernia, the torsion comes on suddenly as a severe stabbing pain in the testicle, usually during or after violent exercises. The scrotum of the affected side rapidly swells and reddens, and the testis is found drawn up and rigidly attached to the cord. The testis, however, cannot be outlined on account of the effusion about it and the extreme tenderness.

The treatment of this condition is to anesthetize the patient, make an incision along the groin down to the testis, open the inguinal canal and expose both cord and testis, and then untwist it. After this gauze soaked in hot salt solution should be applied as compresses to aid in reëstablishing the circulation. If the testis is already gangrenous, or becomes gangrenous during treatment, it should be removed. It is very important to cut down immediately on a testis having these symptoms, as the incision is the great diagnostic point between strangulated hernia and torsion, and the former is more dangerous to life than the latter and requires the quickest possible operative interference.

## INFLAMMATION OF THE TESTES AND EPIDIDYMIS

The inflammatory diseases of the testes and epididymis have never been well classified. Formerly, the testis and epididymis were considered together and little was known of many of the later affections. The classification was then simply acute and chronic orchitis, tuberculous, syphilitic, cancerous and cystic orchitis and fungus testis.

The general classification in this chapter will be epididymitis when the epididymis alone is involved, usually gonococcal; orchitis, when the testis is alone involved, usually a complication of infectious diseases; epididymo-orchitis, when the epididymis and testis are both involved, due to trauma, to infectious diseases, or as a complication of urethritis.

It seems to me advisable at the present writing to consider all forms of

diseases of the testis and epididymis as chronic, except those due to gonococcal urethritis, trauma and infectious diseases. Under the chronic diseases then would be included tuberculosis, lues, cysts and tumors. From my observations in a very large clinic and a hospital service caring only for genito-urinary diseases, I believe that ninety-five per cent of the diseases spoken of as testicular in adults do not occur in the testes proper, but in the epididymis. Furthermore, that all these testicular diseases could be estimated as occurring in the following proportion: Gonococcal epididymitis in eighty-five per cent; tuberculous epididymitis ten per cent; and the remaining diseases in five per cent.

**Etiology.**—*Acute inflammation* of the epididymis and testis is due to gonococcus infection, urethral instrumentations, trauma and infectious diseases.

Epididymitis, except cases due to external trauma, is usually the result of urethral extension from disease and instrumentation. Orchitis in children is principally due to infectious disease and is acute; whereas in adults it is generally due to syphilis and is chronic.

Acute epididymitis is a frequent complication of gonococcal urethritis. It is variously estimated as occurring in ten to twenty per cent of the cases. In my own clinics I do not think that it occurs in more than six per cent and in private practice in not more than two per cent.

*Acute gonococcal epididymitis* is due to an extension of the inflammation from the posterior urethra to the epididymis. This usually occurs during the second or third week, although it frequently takes place during the fourth and fifth weeks of an acute gonorrheal urethritis. It is generally unilateral, although the second testis may also be involved later. In this case, the inflammation in the second organ may take place either immediately after it has subsided in the first, although it usually occurs from one to four weeks later. The exciting causes of this complication are too strong local treatment of the posterior urethra; the neglect of treatment; irritation due to sexual excitement; alcoholism; overexercise, especially dancing, riding and bicycling; exposure to wet and cold and badly fitting trousers that irritate the testes.

Urethral instrumentation is another fairly frequent cause of acute epididymitis and Fournier claims that it is the cause in twelve per cent of all cases. This results from treating urethras by means of instruments during the acute stage of the disease and also in the chronic stage, especially when stricture is present. The cause in these cases is usually an extension of the gonorrheal infection from the posterior urethra; although, if no gonorrhea is present, it may be due to the extension of an infection from some other microörganism that is present in the posterior part of the canal. In passing catheters in cases of prostatic hypertrophy, epididymitis sometimes takes place, in which case the infection in the prostatic urethra is not due to the gonococcus.

Patients having epididymitis during the first attack of urethritis are liable to have it in succeeding attacks. It is advisable, therefore, to warn the patient

in order that he may take care not to expose himself to the causes above mentioned. In recurrent attacks, the inflammation may show itself in the epididymis before any urethral discharge is noticed. In such a case, the infection may have been hiding in the epididymis and extended to and infected the urethra again; if there are urethral shreds present at the commencement of the epididymitis, it is more probable that the disease has been in the posterior urethra during the interval. I am referring to cases without anterior gonococcal reinfection.

**Pathology.**—*Gonococcal epididymitis* is secondary to urethritis, extending along the vas deferens, the walls of which become thickened, and epithelia are thrown off and mixed with mucus and pus. The globus minor is the first part of the epididymis attacked and becomes increased in size. The body of the epididymis then becomes thickened as does the globus major. The ducts of the epididymis become swollen and infiltrated and contain pus, mucus and desquamated epithelia. In both epididymitis and epididymo-orchitis, there is a slight effusion into the tunica vaginalis; the scrotum is also infiltrated and thickened to a varying degree in most cases.

**Symptoms.**—The attack occurs suddenly, generally about the third week of the disease during a posterior urethritis. There are often some prodromal symptoms, such as frequency of urination and tenesmus followed by malaise, anorexia and slight pain in the perineum. This is followed by a feeling of dull pain or fullness in the groin, accompanied by a dragging sensation. Next, the patient usually feels the sensation of weight in the testis followed by acute pain, the pain often radiating to the loin and downward into the thigh. The scrotum over the organ soon becomes very much swollen, red and tender. These symptoms mark the line of march from the posterior urethra into the ampulla of the vas, along the course of the vas and the invasion of the globus minor and body of the epididymis. Sometimes an enlargement can be felt by rectum in the ampulla of the vas on one day, in the cord in the groin on the next and later in the epididymis. The pain is worse when the patient is standing and the clothing presses against the organ. When the inflammation is at its height, the general malaise, anorexia, nausea, chilly sensations and fever may be included in the clinical picture. The temperature is generally slight, not over 100° F., although sometimes it is as high as 103° F.

Many patients with an appropriate support are able to go about and attend to business; whereas others suffer to such a degree that they must remain at home and in bed.

In some cases of *acute gonococcal epididymitis*, the first symptoms resemble closely those of a peritonitis, that is, severe pains in the abdomen radiating to the loins and the thighs, fever, vomiting, frequent pulse and gas distention. These phenomena are noted especially when inflammation of the spermatic cord is marked.

The acute stage lasts for four or five days, when the pain with the local and general symptoms begins to subside. When the attack begins, the urethral discharge diminishes or ceases; but when the acute symptoms of epididymitis subside, the discharge usually returns. Sometimes, however, it does not return, but seems to expend itself in the epididymis or posterior urethra. The swelling in the epididymis diminishes slowly and does not fully disappear for two or three weeks or more. Sometimes the thickening remains for months in the epididymis, usually in the globus minor. At other times, though very rarely, an abscess develops.

In the City Hospital, we had three male genito-urinary wards and the beds on one side of each ward were generally for cases of epididymitis. As I look back on the eighteen years in which I was there as interne and attending surgeon, I can recall but one case in which I considered an abscess of the epididymis due to gonorrhea alone.

The variety of acute epididymitis due to *urethral instrumentation* is less severe, but it is more likely to develop an abscess, in which case the condition is more serious. Fever and sweating characteristic of sepsis then occur. The redness of the scrotum becomes more circumscribed, tense and glossy, and later fluctuation occurs, when it breaks and discharges if not opened. The organ then atrophies to a degree depending on the amount of tissue destroyed. Abscesses, however, are of very rare occurrence and most of the cases of abscess ascribed to acute epididymitis are really tuberculous.

## Acute Epididymitis

**Examination.**—In my practice, I palpate every case of gonococcal complication of the organ, and it is with extreme rarity that I find that the testis proper is involved. Tuberculosis of the testis is, in my opinion, fairly common, but usually secondary to tuberculous epididymitis. I do not believe that I see three cases of syphilitic testis in a year, nor more than one case of malignant testis. Cystic degeneration is very rare in this part of the country. I have never seen more than six cases of fungus testis in my practice. Enchondroma is even more rare.

If the *epididymis* alone is involved, the testis is neither enlarged nor very sensitive. The epididymis forms an elongated tumor, flattened from side to side, convex behind and concave in front, resembling an oval bird's nest in which the testis rests, as would a single egg, completely filling the basket (Fig. 888). The entire epididymis in an acute attack is swollen, thickened and hard. The swelling is due to an inflammatory infiltration of the cellular tissue. It is very tender to the touch and painful when it hangs unsupported, especially when the clothing presses upon it. In very mild cases, some particular part of the epididymis may be principally involved and felt as a

sensitive, swollen and resistant mass, usually the globus minor. In some cases it may not extend farther, whereas in other cases the process may gradually spread to the rest of the epididymis. The scrotum is seen red and swollen and the scrotal tissue thickened on the side involved, the degree depending on the severity of the attack. Prostatitis and vesiculitis are both frequently accompaniments of epididymitis.

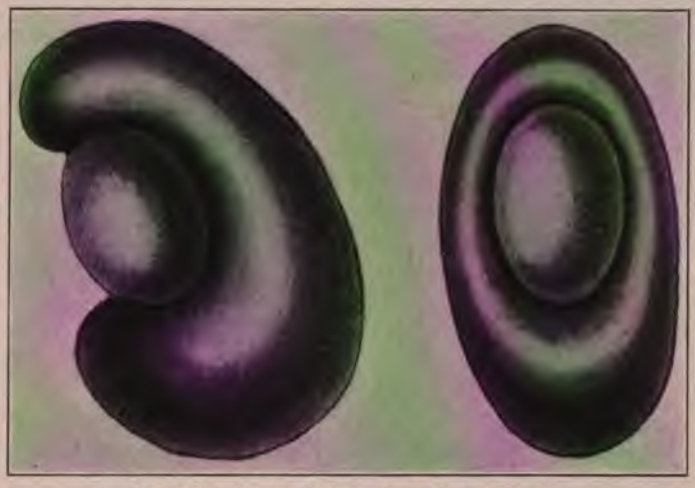


Fig. 888.—Acute Gonococcal Epididymitis.

Much can be learned by daily rectal examinations in a case of acute posterior urethritis, as in this way it is often possible to notice not only the beginning of a prostatitis and vesiculitis, but also the enlargement of the vas deferens and thus to predict that an epididymitis will take place, unless the patient keeps quiet, takes hot sitz baths, antiblennorrhagics and urinary antiseptics internally. The cord may also be felt enlarged in the groin. In examining a patient with epididymitis, if the epididymis is examined carefully, a distinct border can be felt of oval shape, thick, hard and rounded, and in the hollow the testis can be felt of normal size, unless it is also involved, in which case, while maintaining the normal shape and smoothness, it may be enlarged to twice its normal size and hydrocele fluid is present.

**Prognosis.**—There is practically no danger to life in gonococcal epididymitis. I have never known of a fatal case in my own practice or in that of any of my colleagues. Completely obstructed ducts do not cause atrophy. The important point for consideration is that of sterility. It is estimated that in about sixty-five per cent of the cases of double epididymitis, the patient remains sterile. Therefore, a patient who has had a double epididymitis, has one chance in three of being able to procreate. If, on the other hand, he has it on but one side, he has the same chance as any man with a healthy testis who has never had any testicular disease. Atrophy of the epididymis rarely occurs unless an abscess has been present.

### Acute Epididymo-Orchitis

When the testis is involved along with the epididymis in cases of gonorrhea due to extension of the process, which I believe is quite an uncommon

occurrence, the swelling becomes more marked, a larger part of the scrotum becomes inflamed, the pain and constitutional symptoms are increased and there is more fluid in the tunica vaginalis, which increases the pain. The pain also differs somewhat, for, in addition to the pain of epididymitis, which is relieved both in the epididymis and back by support and lying down, there is a feeling of pulling and stretching present in the testis due to pressure of the tunica albuginea.

Epididymo-orchitis may also occur in cases of orchitis in which the testis has become first involved and the epididymis secondarily, as in cases of infectious diseases, also in cases in which the epididymis and testis are both simultaneously involved by an injury, such as a blow or a fall.

The epididymis in epididymo-orchitis is, however, more marked in the cases due to gonococcal urethritis.

Examination shows the epididymis to be enlarged, indurated, in the cavity of which is the testis; but as the testis is larger than normal, it more than fills the cavity, and consequently the rim of the epididymis cannot well be outlined. The tunica vaginalis is also more involved, giving rise to an extra amount of acute hydrocele fluid which pads the anterior part of the mass and makes a larger, fuller and more rounded tumor than when the epididymis alone is involved.

Regarding the results, it can only be said that, in the varieties due to infectious disease and injury of the testis proper, the gland is more liable to be followed by atrophy than when it is due to gonorrhea. Traumatism of the testis has already been considered under Injuries of the Testes.

## Acute Orchitis

We now come to the form of orchitis or epididymo-orchitis due to a general disease of an infectious or miasmatic order. This group embraces mumps, typhoid, malaria, smallpox, chicken-pox, scarlet fever, influenza and tonsilitis.

When an orchitis or an epididymo-orchitis complicates these diseases, the inflammation usually begins in the testis, and from there may spread to the epididymis, although this group of cases has the same tendency to limit itself to the testis as the epididymo-orchitis of gonococcal origin has to limit itself to the epididymis. In these cases, the attack is sudden, coming on with the decline of the disease, or during convalescence. The testis increases to twice its size, and is tender and painful. The attack is usually not severe, and subsides quickly. One or both testes may be involved. It usually ends in resolution, although atrophy is not uncommon, and in cases due to typhoid and smallpox, suppuration is not infrequent. The treatment is the same as that described under Acute Epididymitis. The cases due to mumps, typhoid and malaria will be considered a little more in detail, as they are of decided interest.

In *mumps* the testicular complication is usually a true orchitis, although at times an epididymitis is present from the first. It usually sets in when the glandular swelling is disappearing, which generally occurs about the end of the first week. Boys at about the age of puberty are usually affected, and it almost never occurs in childhood and old age.

The onset of the disease is rapid, the testis enlarging to about twice its normal size, and becoming tender and painful. The contour of the testis remains the same, with the epididymis stretched out over it, being oval in shape. The affection reaches its height on or about the fourth day, after which it subsides quickly. In case it is bilateral, both of the glands are not implicated at the same time, as the inflammation in the first subsides before the second one is invaded.

It is difficult to say exactly in what proportion of cases orchitis occurs. The statistics of certain surgeons in the French army, compiled from data taken from the troops on duty at the time of an epidemic, showed that from ten to twenty-five per cent suffered from this complication. This seems to be a large percentage when we consider the fact that soldiers are not of the age so susceptible to this complication, as are children at the age of puberty. But in epidemics, a disease tends to take on a certain form, and in the statistics of the soldiers above mentioned, the disease was evidently of a severe type, and showed a tendency to affect the testis. In some epidemics, it has been noticed that the orchitis in many cases occurred before the parotiditis, and even when no enlargement of the parotid took place.

The disease generally ends in resolution, although atrophy occasionally takes place. In the statistics of garrison epidemics above mentioned, atrophy was reported to have occurred in about one half of the cases.

In reference to the disease relation between the salivary glands and the testis, it is probable that none exist, but that the salivary glands and the testis are both different localized manifestations of the same pyrexial condition, and the glands most susceptible to its influences. The atrophied testis is from one quarter to one half its normal size. It is about three quarters of an inch long and half an inch wide. It is soft and flabby and has almost entirely lost its normal shape.

In *typhoid fever,* the testis is in rare instances affected, in which case it is probably due to a phlebitis of the spermatic veins. The inflammation occurs with about equal frequency in the epididymis and testis. It generally occurs during convalescence. The attack comes on suddenly, lasting about ten days. It is usually not severe, unless it ends in suppuration, which takes place in about twenty per cent of the cases; atrophy is said to occur in four per cent of the cases that do not suppurate.

This complication also occurs in smallpox, scarlet fever, grippe, rheumatism and gout. In *smallpox,* the inflammation is usually mild, except in cases in

which suppuration takes place, which happens quite frequently. In *scarlet fever* the inflammation is most frequently met with in the epididymis.

The statistics of Lampetti showed in *gout* that one fifth of one per cent of the cases coming under his observation, just before or after an attack in some other region, had a testis swollen to about twice its normal size, which was tender and painful. In *rheumatism,* inflammation of the testis, epididymis, or tunica vaginalis may occur during an attack, and be amenable to antirheumatic treatment.

In *malaria,* orchitis also occurs. This subject has been chiefly written upon by the French observers, who have studied it in the African colonies. From their observations it would seem that there are two forms of this disease, the first of which might be called the true form, and the second the elephantiasic.

In the first form, the testis and epididymis are found to be enlarged *en masse;* the scrotum is edematous; its veins are prominent, and fluid is present in the tunica vaginalis. The whole mass is enlarged to three or four times its natural size, and is hard and resisting. The acute period lasts but for a few days if quinin is given, and the temperature falls rapidly. Resolution takes place in three or four weeks, although the gland may undergo atrophy, or some induration may remain in the head of the epididymis.

Le Dentu speaks of another form of malarial orchitis, which is elephantiasic in character; this is often associated with elephantiasis of the scrotum. It is accompanied by acute inflammatory attacks, lasting for some days.

### Treatment of Acute Epididymitis and Epididymo-Orchitis

This refers especially to the treatment of gonococcal epididymitis or epididymo-orchitis, as it is the most common form; although, with the exception of the internal and local remedies for the urethral trouble, it can be applied to all acute forms of epididymitis, orchitis or epididymo-orchitis from whatever cause. The treatment in these cases is both external and internal. The variety depends on whether the patient is a walking or a bed case, and also whether the attack is acute or subacute.

Probably all patients suffering from this complication would progress more rapidly if they were immediately put to bed; but in business life in cities, patients feel that they must attend to their duties as best they can. Those included in the list of walking patients are generally young men who are engaged in clerical positions; for it would be extremely difficult for laborers, carpenters, masons, mechanics or any men who do manual labor, to perform their work when suffering from this trouble. It, therefore, behooves us to try to relieve our patients sufficiently to allow them to attend to their work during the active stage of the disease. We may start in to treat a patient as a walking

case; but the pain may become so severe that he has to go to bed, when he becomes a bed case. All the cases, however, after the acute symptoms have passed, which usually occurs in four or five days, become walking patients, and the treatment then becomes the same as of those who have been walking cases from the first. As bed cases suffer more than walking cases, we will consider their treatment first and then take it up again, when they are in condition to walk about, together with that of walking patients.

**Treatment of Bed Patients.**—If the patient has considerable temperature and the pain is very severe, he will be obliged to go to bed, for, whereas rest is the best remedy in all cases of epididymis, it is most important in bed cases. In these cases, we can employ, first, applications of the Paquelin cautery, leeches, fifty-per-cent ichthyol ointment or fifteen-per-cent guaiacol ointment, in addition to hot sitz baths, but in case they do not relieve the patient quickly, hot applications should be resorted to. The Continental practitioners prefer ice, especially for the first day or so. It is my opinion, however, that though the ice bag relieves the pain, it tends to devitalize the parts and does not hasten the cure as much as does the application of heat. In applying heat, the hot flaxseed poultice, alone or in combination, is of the greatest value, and gives more comfort and relief to the patient than any other local remedy that can be used. These poultices should fit thoroughly over the affected part, and should be covered by a layer of gauze and oiled silk. They should be changed whenever they begin to lose their heat; that is, about every hour.

There are certain ingredients which, when added to a hot flaxseed poultice, enhance its value to a marked degree. Fifteen to twenty drops of laudanum, sprinkled on the surface of the poultice, increases its efficiency in the relief of the pain. The addition of tobacco to the poultice also increases its value. A tobacco poultice is made by mixing one third of a package of Solace chewing tobacco with the amount of flaxseed meal necessary for one poultice. This probably relieves the patient and hastens the disappearance of the pain more than any other form of poultice that can be used. The tobacco in the poultice is, however, at times sufficient to give rise to quite alarming toxic symptoms, and I have been called to the bedside of a patient by an alarmed nurse who thought that the patient was developing some dangerous complication, on account of a rapid, weak pulse and sweating suddenly developing in a case with quite a marked febrile condition. The support of the scrotum in a bed patient should be by a "T" or scrotal bandage. Sometimes it is sufficient to extend a strip of plaster, five inches wide, called a bridge, across the front of the thighs (Fig. 889), just below the scrotum, upon which the testes may rest. When the pain is very severe, a wet dressing of hot lotio plumbi et opii sometimes relieves the patient more than a poultice.

The general treatment is also more important during the acute stage of epididymitis. As soon as the attack begins, five grains of calomel should be

given, to be followed the next morning by a saline laxative. On each succeeding morning a sufficient amount of a saline laxative, such as citrate of magnesia, Rochelle salts, Apenta or Hunyadi water, should be given, three quarters of an hour before breakfast, to cause a soft movement of the bowels. The diet should be "soft" during the acute stage. (See chapter on Diet, Vol. I.)

Fig. 889.—The Adhesive Plaster Bridge, a Support for the Testis in Epididymitis.

When the pain is so severe that it is not relieved by the above remedies, a suppository can be given containing one grain of codein; or one containing morphia and belladonna, from one quarter to one half grain of each. If suppositories do not relieve the pain when repeated, then a quarter of a grain of morphia can be given internally; or else bromid of potassium grs. xv alone or with chloral grs. 7½, or in addition morphia gr. ¼ can be given in one dose every three to six hours as indicated.

Certain drugs, such as pulsatilla, were at one time thought to be specifics in the treatment of this trouble, but they are now very little used. I have used pulsatilla in a large number of cases, but did not find it as satisfactory as the other remedies that are here mentioned.

**Treatment of Walking Patients.**—When the bed patient is sufficiently relieved of his pain to walk about, usually in five days, he becomes a walking case, and should be treated as a walking patient, and in my practice in the office and clinics nearly all of my cases are walking patients. The principal treatment in these cases, in fact, that which enables them to be walking patients, is to have a satisfactory, well-fitting and well-padded support.

To support well an inflamed testis is a difficult but most important procedure. An ordinary suspensory bandage is usually of little benefit in this stage of the inflammation, and one of the Horend Langleberg pattern is much more efficacious. This bandage is made on the order of an ordinary "T" bandage, with some modifications. One part of the bandage is fastened about the waist. The other part is attached to the back of the waistband and then passed between the buttocks. When it reaches the perineum, it broadens out into a "V" shape, the widest part of which is pinned to the waistband in front (Fig. 890). In applying the bandage, I have always changed the fitting somewhat so as to have the apex of the "V" in the perineum and its sides following Poupart's

ligament. The belt extending around the body to which the base is attached in front I do not place above the crest of the ileum but just below it. This holds the scrotum, testis and genitals up against the pubes, and gives them complete support without allowing them to be jarred or jostled. A thick layer of cotton batting is put over both testes, and a strip of rubber tissue or oiled silk is placed over the cotton. This thick, soft, protective pad between the genitals and the bandage not only holds them in place and protects them from the pressure of the clothing, but also through the heat causes them to sweat and in this way assists in reducing the inflammation. There are now on the market two varieties of bandages which do away with the necessity of using the Horend Langleberg bandage and which the patient can adjust himself. One of these is called the "bike jock," which is made of heavy elastic

FIG. 890.—THE HOREND LANGLEBERG BANDAGE. The bandage shown in this case has been cut in front and pinned together.

FIG. 891.—JOHNSON & JOHNSON RED CROSS ATHLETIC BANDAGE.

material and adapts itself closely to the part, and the other is the Johnson & Johnson Red Cross Athletic bandage (Fig. 891). These can be bought for a trifle at almost any pharmacy and are of the greatest comfort imaginable when worn with the protective dressing of cotton batting. They also serve to hold in place any dressing that one may have to apply. The "bike jock" is better in chronic cases.

The first step in the treatment of a walking patient, independent of the support just outlined, is to relieve him of his pain as much as possible, and with this in view we should first apply the PAQUELIN CAUTERY. In doing this,

we grasp the affected testis in the left hand to steady it, and then brush the cautery blade at white heat lightly over the surface of the scrotum in quick sweeps, just grazing the skin. This is done in several places, leaving reddish stripes as the evidence of the cautery application. The effect of such treatment is often incredible, and I have at times seen patients come limping into the hospital, apparently suffering most excruciating pain, who were almost instantly relieved of their pain by the application of the cautery.

LEECHES are sometimes used for the same purpose. They often diminish the severity of the attack by relieving the congestion, although they never produce such immediate results as does the Paquelin.

LOCAL COUNTERIRRITATION is a valuable remedy. It is best produced by the application of nitrate-of-silver solution in the strength of a drachm to an ounce. This, painted on the scrotum of the affected side twice a day by means of a camel's-hair brush, is probably the next best remedy to the Paquelin cautery for removing the pain quickly. It can also be used in case the Paquelin cautery fails to relieve the pain. The nitrate of silver often blisters the parts, in which case some bland ointment can be applied, as vaselin or oxid-of-zinc ointment.

The point has now been reached in the treatment of the walking patient and the bed patient who begins to walk at which the treatment of both becomes the same.

LOCAL REMEDIES should now be applied on a piece of gauze or sheet lint, and covered by the layer of cotton batting, rubber tissue and the support above referred to. I usually use a fifty-per-cent preparation of ichthyol in glycerin, whereas many prefer a ten- to fifteen-per-cent preparation of guaiacol in the same way. I introduced ichthyol ointment in the wards of the City Hospital at about the time when this drug made its first appearance on the market, and reported the results of a number of cases treated by this remedy at the New York Academy of Medicine, and still consider it a most effective remedy.

PUNCTURE OF THE TUNICA VAGINALIS, and even of the testis, has been recommended by the French surgeons for the acute hydrocele associated with the case. This may be of value, although personally I have never yet felt called upon to resort to this means.

HOT SITZ BATHS.—During all stages of this inflammation, but especially during the acute period, hot sitz baths twice a day are of the greater benefit.

THE THICKENING.—After all the pain has left the testis and the thickening alone remains, absorption can be further aided by iodoform or the iodid-of-lead ointment; the latter is preferable. Strapping of the testis at this stage is recommended by some. I have used strapping extensively in hospital and clinical work, but have long ago discontinued it, as I do not think it can compare with the well-fitting padded supports above mentioned.

The absorption of the exudate or thickening can be assisted by iodids internally. I am in the habit of giving immediately after the pain has left the testis, as an absorbent and tonic, sirup of the iodid of iron and sirup of bitter orange peel, half a drachm of each, in milk or water between meals.

Abscess.—If the epididymitis goes on to suppuration, the abscess should be opened and drained. Such a complication, however, is of the rarest occurrence when it is due to the gonococcal infection. In fact, it is always rare except in cases of injury.

The treatment of the urethritis during an attack of epididymitis is simple. It is principally posterior and the indication is to treat it by instillations of silver or urethro-bladder irrigations by means of hydrostatic pressure according to the Janet method. But such treatment often tends to do more harm than good through the mechanical interference with the posterior urethra.

I might mention that, while irrigation of an antiseptic or an astringent solution appears to be the logical method of treating an anterior and posterior inflammation of the urethra, and whereas I had less cases of epididymitis while I employed this means, I nevertheless had a far greater number of cases of prostatitis and vesiculitis develop than ever before. Antiblennorrhagics, as copaiba, sandalwood oil or the oil of cubebs, should not be given when any febrile symptoms are present, as they do not have any effect on the principal seat of the inflammation, the epididymis, besides not being well tolerated by the stomach. But after the acute symptoms have subsided, they can then be freely given, as they are of decided benefit in curing the inflammation of the posterior urethra, which has given rise to the inflammation of the testis, and which is always present while this complication lasts. Urinary antiseptics that are recommended in the treatment of this trouble are of doubtful efficacy and are not recommended. If the urine is highly colored and of a diminished amount, a mixture containing the acetate of potash and sweet spirits of niter should be given. As soon as the discharge begins to return, or if the discharge is present during the attack of epididymitis, injections of a solution of protargol 1 : 300 can be given by a urethral syringe. If the inflammation remains in the posterior of the canal it should be treated as described under Posterior Urethritis.

For neuralgia of the testis following epididymitis, the Paquelin cautery, applications of silver-nitrate solution (1 : 8) and ichthyol ointment are recommended.

In recurrent attacks of epididymitis, especially when the swelling of the epididymis occurs before any urethral discharge, and always in the same testis, vasectomy is recommended, although all such cases in my practice have recovered after a few attacks without operation. For sterility following double epididymitis Martin's operation is recommended. I will quote the description from White and Martin:

"Sterility dependent upon absence or imperfect development of any portion of the secreting or excreting apparatus is incurable. When due to gonorrheal epididymitis of comparatively recent origin it usually proves amenable to the treatment described under the head of Gonorrheal Epididymitis. When the obstruction persists, we have succeeded in relieving it by performing an anastomosis between the vas and that portion of the epididymis to the testicular side of the obstruction. The vas lies behind the spermatic artery, which sends its main branches forward to the inner side of the epididymis, anastomosing freely at this point with the artery of the vas. The epididymis is approached from its outer side. A portion of the head is picked up in toothed forceps

Fig. 892.—Martin's Operation. Showing the first steps of the anastomosis of the vas and epididymis. (From White and Martin.)

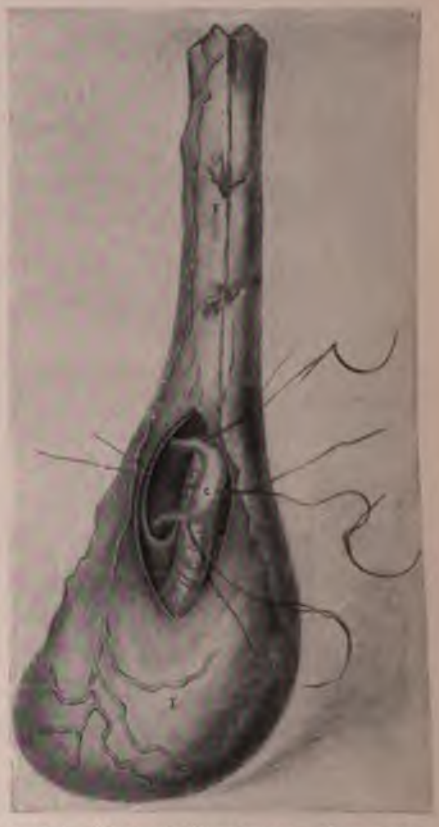


Fig. 893.—Martin's Operation. Shows the second step of the anastomosis of the vas and epididymis. (From White and Martin.)

and excised. If this excision is made on the testicular side of the obstruction there will ooze from the wound, semen which contains motile spermatozoa. The lumen of the vas is opened by a longitudinal cut one quarter of an inch long. Into this wound of the epididymis the vas is implanted by means of four fine silver-wire sutures, carried on small face needles from the outer sur-

face of the vas into its lumen; thence from the cut surface of the opening made into the epididymis through its fibrous tunic. Because of the smallness of the structures involved, the operation is tedious rather than difficult. Aside from the ordinary surgical instruments, there will be needed a sharp-pointed pair of scissors, a slender bistoury and a grooved director, such as are used by ophthalmologists.

"When the sterility is dependent upon blocking of the common ejaculatory duct, no treatment has been suggested which promises favorable results. Sterility dependent upon stricture is cured by full dilatation of the urethra. If due to muscular incoördination, tonic or stimulant treatment directed to the general nervous condition may be beneficial. That form of sterility which is apparently dependent upon chronic suppuration of the prostatic urethra, ejaculatory ducts, seminal vesicles and ampullæ of the vasa is best treated by massage, combined with unirritating antiseptic urethral irrigations."

### Chronic Inflammatory Epididymitis

This is the result of an acute epididymitis.

**Symptoms.**—It may give rise to slight pain of a dull character or of a neuralgic type. The testes may in some cases be irritable and cause the patient considerable distress as well as anxiety. Sometimes there are recurrent attacks of epididymitis after overindulgence in venery or alcoholics, in which case they are usually of a mild character and short duration. Occasionally such an attack is followed by a mild urethritis.

Examination shows a well-rounded nodule of the epididymis, usually of the globus minor, indurated to the touch and sometimes tender.

**Treatment.**—The treatment is principally symptomatic, consisting in applying ichthyol ointment, fifty per cent, or any of the local counterirritants mentioned under the treatment of acute epididymitis. In cases associated with recurrent attacks of urethritis vasectomy has been recommended. In cases giving rise to considerable suffering on the part of the patient and with no diminution in the size of the nodule, it can be removed. As yet I have never seen a case of this kind in which I considered orchidectomy indicated.

## TUBERCULOSIS OF THE TESTIS

(*Tuberculous Epididymitis*)

Probably the most frequent disease of this organ next to the gonococcal variety, is the tuberculous epididymitis. Formerly tuberculous conditions following gonococcal epididymitis were regarded as a chronic suppurative form of that trouble in many cases. Tuberculosis is far more common in the epididymis than in the testis, and clinically we often do not know whether or not

the testis is involved. Certain cases that have come under my observation from time to time have led me to believe that I may have underestimated the frequency of the involvement of the testis proper, although my personal findings do not by any means agree with those of Reclus, who says that in seventy-five per cent of tuberculosis of these organs both the testis and epididymis are involved.

A clinical examination of the gland may show tubercular nodules in the epididymis alone, but this does not prove that the testis is not involved as well, as the epididymis is but a thin band and the tubercular lesions are more in evidence upon it than when they are situated in the testis. Lesions of the testis would, however, be seen at autopsy and on examination of the organ after its removal. Lesions situated in the epididymis change the form of the epididymis in such a way that one may be led to believe that it is in the testis.

**Etiology.**—Tuberculosis of the epididymis generally occurs in people from the twentieth to the thirtieth year of age, although it is also common up to the fiftieth year.

It is probably always secondary, due to extension from other parts of the genito-urinary tract along the vas deferens, or to transmission through the circulation from more remote regions. Some authors say that it is generally secondary to tuberculosis of the prostate, while others consider prostatic tuberculosis second to that of the testis. I had always thought, until I began to study the subject carefully, that tuberculous epididymitis was more common than that of the prostate and that the tuberculous process usually extended from the epididymis to the prostate. The prostate is, however, the most frequently involved and is attacked by the tuberculous urine coming from the kidneys by continuity from the bladder and epididymis and by the hematogenous route. It is more difficult to diagnosticate tuberculosis of the prostate than that of the testis, as the lesions are not so much in evidence.

Predisposing Causes.—Heredity predisposes to tuberculosis of the epididymis as to tuberculosis elsewhere. Two other common predisposing causes are injury to the epididymis and a chronic thickening remaining after a gonococcal epididymitis. In the latter case, the chronic nodules remaining are especially favorable for infection and its development. The active cause is the entrance of the tubercle bacilli into these debilitated areas.

**Pathology.**—Two varieties of tuberculosis of the testis and epididymis are generally described, the acute and the chronic. In the acute cases, there is the formation of a tuberculous area in the testis, epididymis or cord. If it should be cut down upon early in the disease, the entire epididymis would appear red and thickened with one or more clusters of tubercles upon its surface, usually in the globus major, resembling a cluster of tubercles on the surface of the kidney. The epididymis may be perfectly smooth.

Later, when suppuration takes place, one or more abscesses develop, which

rapidly suppurate and discharge through a sinus in the scrotum. This area heals by the formation of new connective tissue, leaving only an indurated mass.

The CHRONIC variety is more common. It usually appears as one or two nodules in the head of the epididymis. They are hard, and of a grayish-red color on section. As the disease progresses, the number of nodules may increase until, in an advanced case, the whole epididymis is one mass of tubercular or fibrous tissue. The seminal canals become dilated and filled with a grumous, cheesy material, while their walls are gradually destroyed and coalesce to form cavities filled with cheesy material, usually resulting in tuberculous abscesses which rupture and form a fistula.

FIG. 894.—TUBERCULOUS TESTIS AND EPIDIDYMIS. Note thickening in the epididymis. (Author's case.)

The changes in the vas deferens when it is tuberculous, are similar to those of the epididymis (Fig. 894).

When the testis is involved, yellowish-white nodules appear, which create and form cavities that may rupture and discharge through the scrotum. The discharge from tubercular areas in the lobules of the testis tends to follow the course of the seminiferous canals through the mediastinum, rather than to make its way through the tough tunica albuginea.

A tuberculous epididymo-orchitis often shows neither nodules nor tubercles in the first stage of the disease, but an enlargement of both epididymis and testis. Acute and chronic tuberculosis of the testis are terms used to show the degree of involvement in two forms of tuberculous testis. To my mind all cases of tuberculous testes are of a chronic type.

**Symptoms.**—SUBJECTIVE SYMPTOMS.—In the *acute form,* the epididymis becomes quickly enlarged and there is considerable pain and a feeling of weight in the testis. It then becomes tender to the touch in the area most involved and may closely resemble acute gonococcal epididymitis symptomatically. It is said that there may even be a urethral discharge containing tubercle bacilli, a condition which I cannot recall as having observed. The cord is generally felt to be thickened; the prostate may also show on palpation an area of softening or nodulation.

In the *chronic form*, there may be no subjective symptoms and the patient's attention may first be called to the condition by noticing an enlargement of the epididymis. Frequently, however, there is a period of sexual irritability pre-

ceding or accompanying the development of the trouble, such as frequent erections with seminal emissions, although these symptoms can also be due to a tuberculous process in prostate and vesicles in case they are involved.

The OBJECTIVE SYMPTOMS are the presence of one or more nodules, usually in the head of the epididymis, sometimes in the tail or in the body between the two. Generally, the entire epididymis is somewhat thickened. The nodules have a peculiar feel. They are not always rounded, but may have an irregular flattened and angular outline like smooth faceted calculi imbedded in the tissues. They are hard and at times almost feel like pieces of wood, with edges smoothed off, tucked beneath the tissues. At this stage they cause little or no pain, nor tenderness. As the disease advances, the swelling becomes greater about the nodules. The remainder of the epididymis may not enlarge, but it is usually felt as a hard elongated nodular swelling. There is at times an effusion of fluid into the tunica vaginalis. Fluid in the tunica is a much more frequent accompaniment of tuberculosis of the testicle than is generally supposed, and the writer is of the opinion that it should be more carefully considered in the symptomatology of hydrocele.

As the disease progresses, the nodules may undergo resolution, or they may break down into abscesses. The stage of softening of the tubercular nodules in chronic tuberculous epididymitis usually sets in a few months after their first appearance and, as the abscess develops, the scrotum over it becomes red and adherent. The abscess breaks spontaneously if not incised and the cavity heals, or the destructive process may extend and suppurating sinuses continue. The openings vary in size, site and number. They are usually found in the lower and back part of the scrotum. The size of the epididymis is usually not so great as in gonococcal epididymitis and yet it is sometimes quite large. The size is exemplified by seeing abscesses of the globus major or minor pointing forward and others from the side of the epididymis which also point to the front.

The edges of the fistulas may be smooth, or studded with sprouting granulations. The purulent discharge becomes thinner and scantier in the later stages, and the openings may persist for a long time. Often when they heal, they may reopen any time when an exacerbation of the trouble occurs. These long-existing sinuses are sometimes due to the constant discharge from the slowly destroyed testis taking place through the sinus in the epididymis. There may be no pain in the testis and the surface contour not at all changed.

GENERAL SYMPTOMS of tuberculosis may be found in some cases and they serve to a certain extent as corroborative signs. It is to be noted, however, that the cachexia may be absent in well-defined cases when the process is limited to the genital tract and there are no evidences of it elsewhere in the body.

The PHYSICAL SIGNS obtained by rectal examination, showing an involvement of the prostate and vesicles, are of great value in the diagnosis of the disease.

**Diagnosis.**—Tuberculous epididymitis differs from GONOCOCCAL, in that, in the former, it is usually chronic, while, in the latter, very acute; in the former, there has perhaps been no urethral discharge, in the latter, always a history of urethritis; in the former, there are nodules present, in the latter, it is smooth; in the former, suppuration of the epididymis is common, in the latter, it is extremely rare. In the former, evidences of tuberculosis may be found elsewhere in the patient, or tubercle bacilli may be found in the discharge from a sinus, whereas, in the latter, gonococci may be found in the urethra or in massaged products from the prostate.

Tuberculosis is differentiated from SYPHILIS as (1) the former usually involves the epididymis and the latter the testis; (2) in the former, there is a history or present signs of tuberculosis elsewhere, in the latter, there is the history of former luetic lesions; (3) finally we have the finding of the tubercle bacilli in the former and the test of Wassermann reaction in the latter, and also the fact that the former is not benefited by antisyphilitic treatment and the latter is. In the former, the epididymis is nodular, irregular and more or less enlarged and the testis is generally of a normal shape and size; in the latter, the testis is usually smooth and large and the epididymis is drawn out over it; again, in the former, an involvement of the internal genitals (prostate and seminal vesicles) may be felt, whereas, in the latter, it is not present.

In differentiating between tuberculous and GUMMATOUS EPIDIDYMITIS, it may be that both are nodular with a tendency to break down; but in the case of gumma it leaves a pushed-out looking cavity very different from that of a broken-down tubercular nodule.

Tuberculosis is differentiated from MALIGNANT TESTIS by the fact that the former usually occurs between the ages of twenty and forty, the latter in older men. In the former, it is usually situated in the epididymis; in the latter, in the testis. The dragging feeling and pain in the back are much greater in the latter, and there is also an absence of tuberculous lesions in the internal genitals or elsewhere in the system. In the former, there is the history of tuberculosis in the family and the presence of the tubercle bacillus; whereas, in the latter, there may be a history of malignancy.

In regard to the diagnosis between CHRONIC TUBERCULOUS and CHRONIC GONOCOCCAL epididymitis, it may be said that, in the former case, the enlargement is usually in the globus major, in the latter, in the globus minor. In the former, the nodule is harder and more irregular in form, whereas, in the latter, it is more rounded. In the former, there is more tendency to break down than in the latter. It must not be forgotten, however, that a tuberculous process may develop in a nodule of chronic epididymitis, which would make the diagnosis rather confusing.

Finally, in all cases of suspected tuberculosis of the testis, in which hydrocele is present, the injection of the fluid into guinea pigs is conclusive.

**Prognosis.**—The prognosis varies with the extent and rapidity of the process and with the presence or absence of tuberculosis in other organs of the body. The local process frequently heals spontaneously, and there is nothing left but a sclerosed and atrophied testis. I feel that I can usually stop the process in a tuberculous testis in case the patient comes to me early enough, and his lungs and kidneys are not involved. This I can do by appropriate medical and hygienic treatment and minor operations in case of suppuration. In case the epididymis and testis are practically destroyed by suppuration when the patient presents himself, or a recent case grows rapidly worse under treatment, I resort to the radical operation.

**Treatment.**—This divides itself into the hygienic and supportive, medical and surgical. The HYGIENIC AND SUPPORTIVE TREATMENT consists in the observance of the dietetic and hygienic measures that are usually observed in cases of tuberculosis elsewhere in the body, such as change of climate and plenty of fresh air, sun and rest. The cases that have been sent away to the mountains, or inland, have been much improved in most instances, as the climate there is much better for them than is the seashore. The patient, after the change of climate, should remain out-of-doors as much as possible during the day in sunny weather, but in rainy and damp weather should remain in the house. He should sleep from eight to twelve hours out of the twenty-four. He should not dissipate, he should wear flannel underclothing and it is important that he should wear a support such as was described under Treatment of Acute Epididymitis. His food should be the same as for tuberculosis of the lungs or elsewhere.

The INTERNAL MEDICINE is to my mind very important: Creosote ♏iij. three times a day; sirup of the iodid of iron half a drachm three times between meals in milk and water.

LOCALLY, iodid-of-lead ointment to the testis.

SURGICAL TREATMENT.—In the treatment of tuberculous epididymitis, every observer has seen nodules, with all the clinical appearance of tuberculosis, remain in *statu quo* for years, although it is not uncommon to see them break down, suppurate and heal. It must not be thought that in every case of tuberculous testicle the involvement is extensive and the patient is cachectic, as it often occurs in strong and healthy men. Personally, I do not believe in performing a castration for fear that worse symptoms may appear, but in putting my patient in such condition that he will improve rather than grow worse: also, in case operative procedure is indicated, to do as little as possible, unless the case is hopeless.

I have at present under observation two patients who suffered from tuberculous testis, each of whom has lost a brother from tuberculosis, the first signs of which began in the epididymis. These patients, although strong men, are both very much worried about their condition. They have already been under

observation for over fifteen years, and as yet there has been no sign of suppuration in the lesion. They occasionally have ephemeral attacks of congestion, attended by pain and discomfort for a number of days, but they have not as yet come to a point where operation is indicated and probably never will, as they are both in better condition than when they first came under observation, and the presence of a thickening of the epididymis, together with their family history, is a constant warning to them to live a healthy and careful life.

*Incision and draining* is a good method to employ after a tuberculous lesion has developed into an abscess, after which the cavity should be cauterized with pure carbolic and swabbed out with alcohol, as by this means not only is the cavity disinfected, but no open vessels remain to reabsorb the infection and carry it elsewhere. After an abscess has been opened, it should be dressed with balsam of Peru or iodoform until it has healed.

*Aspiration.*—Another good method sometimes used is to aspirate the abscess cavity and then to inject a ten-per-cent emulsion of iodoform into the evacuated abscess cavity. This disinfects the cavity and stimulates the process of granulation. Sinuses can also be treated by this means. *Curetting* a tuberculous lesion is dangerous, as it loosens the tissue and predisposes to hernia of the testicular parenchyma.

By these simple means I have had the best results. I have in this way stopped the process in cases of double tuberculous epididymitis, in which I have had to open two or three abscesses on each side.

Operations.—If the epididymis does not improve, but loses ground, and the suppuration increases and the patient is losing weight and strength, a part of the epididymis, the whole of it or both the epididymis and testis, should be removed. After removing the epididymis, if the testis is also involved, a sinus will be found extending into it, and if slight pressure causes pus to escape, it is advisable either to remove it then or shortly afterwards in case it does not cease to discharge.

*Resection,* removal of part of the epididymis, consists of excising a tubercular nodule from the epididymis in cases in which only one, or perhaps two, well-defined lesions are present.

*Epidectomy* consists in removing the entire epididymis. Such an operation is performed when there are numerous nodules present, or where there have been numerous abscesses which have broken down, leaving sinuses communicating with it. In performing this operation when sinuses are present, the incision should be made over the region of the openings and then, having cut down upon the epididymis and freed it from the adherent skin and tunica, the entire mass should be removed. In this procedure, it is not necessary to cut through all the vessels of the testis, but rather those going to the epididymis alone, which leave a sufficient blood supply to nourish the testis. For technique of the operation, see the last part of this section.

If, after removing the epididymis, it is seen that the process extends into the testicle, castration then or later should be performed, as the operator sees fit. One frequently finds what appears to be clinically an uninvolved testis associated with a broken-down tuberculous epididymitis and yet when the epididymis is removed, the process is found to extend well into the glandular tissue.

I shall always remember the case of an Italian musician at the City Hospital, one of whose testes had been removed for tuberculosis some years before and who again entered, complaining of the other side. The remaining organ was seen to have on the scrotum a number of sinuses leading into its epididymis, but the testis proper was smooth and of normal size and apparently free from involvement, although slightly harder than usual. I decided to perform an excision of the epididymis, after removing which the tuberculous process was seen to extend by a sinus into the testis. I then attempted to curette away the diseased tuberculous tissue and, when I had finished removing the caseous and purulent débris, I found that only an uncollapsible shell remained, consisting of a tunica albuginea and the thickened visceral layer of the tunica vaginalis.

Such a case is very instructive, because it brings out two important points: First, that one can never be sure from a clinical examination how much involved the testis proper may be; and second, that a tuberculous process in the gland is secondary to that of the epididymis, and after breaking down, it is liable to discharge its contents by the epididymal route. Thus, before doing excision of the epididymis upon a patient, it is well to have his permission to remove the entire gland if necessary.

*Castration* should be performed in cases in which both the epididymis and the testicle are involved in a destructive process, as is evidenced by the formation of sinuses leading into them.

For the technique of castration, see the last part of this section.

## LUES OF THE TESTIS AND EPIDIDYMIS

Lues generally attacks the testis proper and in the tertiary stage of the disease. The epididymis, according to some writers, is never affected, except by a peculiar type of induration which takes place during the secondary stage of the disease and which may be termed luetic epididymitis.

**Luetic Epididymitis.**—My own experience with luetic epididymitis, however, has been with the late stage. I believe it to be more common as a late lesion than the syphilographers state, and have been pleased to have had my diagnosis confirmed when presenting cases of this kind before medical societies, the members of which were specialists in this line of work.

The epididymis is rarely the seat of luetic disease and yet there are three forms:

Secondary Luetic Epididymitis.—During the secondary stage, generally from the third to fourth month, a lump or hard nodular swelling from the size of a pea to a lima bean may occur on the epididymis, usually on the globus major.

Tertiary Epididymitis.—The epididymis may also be markedly enlarged, having a smooth surface closely resembling a sarcocele of the testis, and it is these cases that I have been especially interested in.

Gummatous Epididymitis.—Gumma may appear in the testis and they may also be found in the epididymis, giving it an irregular outline.

**Luetic Orchitis.**—Virchow, whose classification of this affection is based upon pathological rather than clinical observations, considers that there are two varieties of syphilitic orchitis, the diffuse or sarcocele, and the circumscribed or gummatous.

Etiology and Frequency.—Luetic orchitis is not a common occurrence in the average well-treated case at the time of the present writing. There are cases on record where the only manifestation of lues was the characteristic orchitis, which appeared at variable intervals after the primary lesion, usually midway between the secondary and tertiary stages.

Lues of the testis is due to metastasis, as was proved by Malasse and Reclus, who showed that the luetic lesion of the testis began with the formation of microscopic aggregates of cells around the blood vessels of the portion affected.

Age is to a certain extent a factor in the etiology of this trouble. Hereditary lues gives rise to an orchitis in one third of the cases, in very early life, according to Parrott and Hutinell. In cases of acquired lues, however, the testes are usually not involved until after the age of thirty, but as the disease may not develop until thirty years after the appearance of the initial lesion, it may develop in persons of advanced age who have for a long time been living exemplary lives.

The average date of appearance of luetic orchitis after the primary infection is three and a half years, although it may appear at any time from three and a half months to thirty years.

Pathology.—The *diffuse form* is characterized by the formation of dense interstitial connective tissue, resulting in the enlargement and induration of the organ. The sclerotic process finally sets in, producing anemia and atrophy of the testicular substance. The chronic hyperplasia is analogous to the tertiary luetic process in other parts of the body. Gummatous masses may be present in the thickened tunica albuginea, which project somewhat upon its surface and give rise to the nodular feeling which is characteristic of certain cases of luetic testis. The tunica vaginalis may also be thickened and its cavity partly obliterated by the adherence of its walls. It may contain a certain amount of hydrocele fluid.

The *gummatous form* has been called "circumscribed," because the lesion

assumes the type of gummatous tumors. This form may be combined with the diffuse variety, however, and the distinction is of no particular importance (Fig. 895).

Symptoms and Course.—The disease usually comes on without pain slowly and insidiously. The patient often does not notice that there is anything the matter with the testis until some incident draws his attention to the organ. The chief subjective symptom is a dragging sensation in the loin and along the cord, and a dull pain in the back. Sometimes the disease develops so suddenly that the attack may be called subacute and occasionally even acute, in which cases the pain and tenderness may be so marked that they may be mistaken for acute gonococcal orchitis, although such attacks are rare.

Fig. 895.—Luetic Testis. (After Reclus.)

The trouble is sometimes bilateral, although both testes are rarely affected simultaneously, and in fifteen years at the City Hospital I saw but one bilateral case. The disease usually undergoes resolution in favorable cases when treatment has been started in early and carried out systematically. If untreated, it runs a very chronic course, lasting for years, and is certain to result in atrophy of the testis. In some cases, atrophy comes on rapidly and is complete; in others, it occurs gradually and may affect only a part of the organ. The sexual vigor is usually not impaired.

Certain cases of luetic orchitis may be accompanied by the breaking down of the gummatous tissue. The resulting débris of the suppurative process may be discharged through the scrotum and at times may lead to a hernia testis or fungus testis.

Diagnosis.—Lues of the testicle is mistaken for tuberculosis, sarcoma and carcinoma. On palpation, the testis in sarcocele is found to be round or oval in shape, heavy and hard, sometimes the size of the fist and perfectly smooth or nodular. When its surface is nodular, it is due to gummatous nodules, varying in size from a pin head to a cherry, that may be felt in the tunica albuginea. The testis nevertheless maintains its general form. Hydrocele is occasionally present and the fluid in the tunica vaginalis accounts for a part of the swelling in some cases, but one is usually able to feel the organ through the layer of fluid. The gummatous nodules occur with the greatest frequency on the anterior aspect of the organ. The various portions of the testis vary in consistence, according to the amount of thickening and luetic deposit. In the gummatous form, single hard masses may be felt. The two varieties,

the sarcocele and gummatous forms, occur together so frequently that it is impossible to distinguish the exact pathological condition of the testicle by palpation.

**Treatment.**—Treatment often restores the function of the testis, except in the more advanced cases. Sterility occurs only when both testes are involved.

INTERNALLY, mixed treatment alone, or with a certain amount of iodid of potash in addition, should be given.

EXTERNALLY, a mercurial ointment should be applied, either the ordinary mercurial ointment, the citrin or the ammoniate. The patient should be put in the best general condition by means of tonics and exercise. Soaking the testis in hot water is also of value.

## TUMORS AND CYSTS OF THE TESTIS AND EPIDIDYMIS

**Carcinoma.**—This is the most frequent form of tumor of the testicle. There are two varieties, the *medullary* or *encephaloid* and the *scirrhous.* Of these the former is the more frequent, the latter being rarely seen.

ETIOLOGY.—Traumatism, as a blow or a crushing injury, is said to be a predisposing cause of cancer. It gives rise to an acute orchitis, which soon subsides, to be followed later by a new growth. Retained testicle is also a cause, as already mentioned, as it is liable to injury.

The usual age for the development of carcinoma of the testis in adults is between twenty-five and forty-five years, whereas in children it is found at an early age, usually before the fifth year.

The relative frequency of cancer of the testis, according to the table of Sir James Paget, was 2.8 per cent of the cancers of all parts of the body.

PATHOLOGY.—On section, a cancerous testis of the *encephaloid* type appears soft and pultaceous, usually of a pinkish-white color. The stroma generally consists of thin delicate fibers, although it is occasionally dense as in the scirrhous variety. The tumor may undergo degeneration and then the cavities are found to contain blood, mucus and caseous or colloid substances. When this is squeezed, a creamy fluid exudes, known as cancer juice.

The tumor usually grows in such a way as to mask the epididymis, which is involved in the carcinomatous process in over sixty per cent of the cases. The microscopic changes in encephaloid cancer are those of alveolar carcinoma, and of various types of degeneration.

The *scirrhous* variety is characterized by the fact that it occurs in older individuals, that it is of slow growth and does not reach the size of an encephaloid tumor.

It is very hard and dense, and *creaks* on section. It contains little or no cancer juice. The microscopic feature of scirrhous carcinoma of the testis is principally the presence of dense connective tissue.

Symptoms.—The swelling comes on slowly and insidiously. An early symptom is a dragging pain in the groin, loin and back, often unbearable; in some patients it is neuralgic. There is very little pain and tenderness in the testis and the testicular sensation may be absent. The growth is rapid, but its character is so progressive that it may reach a considerable size before the surgeon is consulted (Fig. 896). The scrotum is distended and the veins are enlarged. The tumor is usually ovoid and smooth in outline at first, but later becomes nodulated, owing to the giving way of the tunica albuginea under pressure from within. These nodules are usually soft. There is usually a certain amount of sanguineous fluid in the tunica vaginalis. This may be absorbed and cause a temporary diminution in the size of the growth.

Fig. 896.—Carcinoma of the Testis. (After Monod and Terrillon.)

The two layers of the tunica vaginalis become adherent and later the skin may be involved and perforated by the cancerous process in the form of a fungating mass (fungus testis). The cord is never involved in the early stages, although later it may be enlarged.

The iliac and the lumbar retroperitoneal glands become enlarged, but can rarely be felt in adults. They press on the iliac vessels and vena cava, causing an enlargement of the veins of the lower extremity and often edema.

The epididymis is at first free, but is finally involved by the growth and cannot be felt.

The last stages of carcinoma are characterized by cachexia, which, according to Lucke, depends upon the presence of secondary metastatic tumors. The first metastatic growths usually appear in the retroperitoneal glands, which can occasionally be made out by palpation on either side of the spinal column near the lower end of the kidney. The mass of glands in the loin is sometimes sufficiently large to be mistaken for a tumor of the kidney, and only a short time ago I had such a case referred to me from the medical side of the hospital for operation. The detection of the absence of the testis on that side and the cicatrix of an incision on the scrotum led to an investigation showing that the testis had been removed for cancer. The liver and lungs are next liable to be affected.

The symptoms of the cachexia usually appear rapidly in these cases. They consist of pallor, emaciation, muscular weakness, anorexia, nausea, vomiting and jaundice. Ascites may be present due to the affection of the liver or to secondary peritonitis.

The presence of metastatic growths in the lungs causes a cough, hematemesis, dyspnea and swelling of the supraclavicular glands. Percussion shows dullness over the involved areas.

DIAGNOSIS.—The diagnosis depends on the symptoms just mentioned. Advanced cases are easily diagnosticated and the chief difficulty lies in the early stages, where surgical interference might be of some avail. The cases that are preceded by a traumatism or blennorrhagia are often perplexing and usually all cases of this kind should be regarded with suspicion when, instead of undergoing resolution, they continue steadily to enlarge.

PROGNOSIS.—The prognosis depends almost entirely upon the presence or absence of metastatic involvement of the abdominal glands. According to Paget, the duration of encephaloid carcinoma of the testes is usually two years, when the disease terminates fatally. The scirrhous variety is slower, and may last from eight to fifteen years. An early diagnosis and operation are therefore called for. A number of cases have been reported where there were no recurrences from two to fifteen years after the operation.

TREATMENT.—The treatment of this affection can be expressed in two words: Immediate removal (orchidectomy).

**Sarcoma of the Testis and Epididymis.**—The usual pathological classification includes the small and large round-celled and spindle-celled varieties. There are a number of subvarieties determined by certain degenerative changes, or by combinations with other new growths, such as *myxosarcoma, cysto-sarcoma, fibro-sarcoma, chondrosarcoma, giant-celled sarcoma, alveolar-sarcoma, angio-sarcoma* and *melano-sarcoma.*

ETIOLOGY.—Of the etiology of testicular sarcoma but little is known, and generally the cause of the development or growth cannot be discovered. Early childhood and late manhood are the most susceptible ages, and comparatively few cases occur between the ages of fifteen and thirty-five. It may be primary or secondary, most frequently the former. The second testis may be involved in either case three to ten months later. Sarcoma of the testis is more frequent than carcinoma, and when there is any question as to which variety of neoplasm is present the diagnosis should be sarcoma until the microscope shows it to be something else.

PATHOLOGY.—The naked-eye appearances on section are as follows: The tumors are whitish, yellowish or grayish-red in color. The surface is homogeneous like bacon in the harder variety, and brownish in color in the softer types. The cut surface is smoother and more glistening than that of carcinoma. The firmer tumors have a more lobulated appearance and show the presence of white fibrous bands traversing this substance. There may also be cysts or cavities filled with extravasated blood or caseous material, as in carcinoma.

The shape of the tumor is generally oval or round, and if firm it retains its regular outline until late in the disease.

*Fibro-sarcoma.*—This refers to a variety of spindle-celled sarcomata characterized by an unusually large amount of fibrous connective tissue which makes them very hard and dense.

*Chondrosarcoma* is a name given to a sarcoma when hyaline cartilage is present in the growth.

Sarcomata have a tendency to undergo secondary changes.

*Cysto-sarcoma.*—This is a variety in which the tissue undergoes liquefaction from necrosis, or there is effusion of blood in its substance, and cavities are found in the growth.

*Giant-celled sarcoma* is a class described by some pathologists in which there are a greater or lesser number of multinucleated cells among the ordinary round cells and spindle cells of the tumor. These large cells resemble the giant cells of the bone marrow. The cut surface of these tumors is dark brown in color, resembling liver tissue.

*Melano-sarcoma* is a type in which a black pigment is found present in the cells and intracellular substance which gives the tumor a dark tint.

*Myxosarcoma* is a kind of sarcoma which undergoes myxomatous degeneration.

Symptoms.—The clinical course and symptoms of sarcoma are so similar to those of medullary carcinoma that we refer to that disease for these details. The differential diagnosis of these conditions is not important, inasmuch as in the clinical histories, in their physical and naked-eye appearance and in their malignancy they do not present any striking or easily recognized difference. It is more likely to be bilateral than carcinoma.

Fig. 897.—Cyst of Testis, Epididymis and Cord. (Author's case.)

The diagnosis from other troubles, especially syphilis, is the same as that of soft cancer.

Treatment.—Removal.

**Cystoma or Cystic Disease of the Testis.**—This growth of the testicle is one of the rarer types of enlargement which occur in that gland.

Etiology.—The origin of these cysts is not fully known. It is probable that some of them are of a malignant nature, as carcinomatous or sarcomatous cells have been found in them by pathologists. These cysts may be associated with sarcoma, with carcinoma or with enchondroma.

Pathology.—The cysts are usually multiple, their walls are tough and they form masses of considerable size. The individual cysts vary in size from a millet seed to a pigeon's egg. They may contain clear serous fluid, or their contents may be

cheesy and thick. They may contain extravasated blood. The cysts are limited by capsules, and the whole growth is usually surrounded by a fibrous wall. Fig. 897 shows cysts springing from the upper part of the testis, cord and the epididymis. It gave rise to much pain, not relieved by orchidectomy.

They are lined with cylindrical epithelium, which may be ciliated. The epididymis may not be involved, although it may be more or less completely masked by the cystic growths. The tunica vaginalis may be adherent, or may contain some hydrocele fluid.

SYMPTOMS.—The disease comes on insidiously like sarcoma or carcinoma. The usual age is that of middle life. Sometimes in the initial stage it is attributed to a traumatism. A dragging sensation in the groin and along the spermatic cord is usually first noticed, together with a slight enlargement of one testicle. As the disease progresses, the testicle becomes a large elastic mass, usually showing several ovoid or globular bodies, some of which may show fluctuation, while others are more resistant. It is not painful. The veins of the scrotum become enlarged and the skin distended.

Where fluctuation is felt, the best test is an exploratory puncture. The fluid escapes and the cyst collapses. It is distinguished from cancer in that the latter does not collapse on puncture, although some fluid may escape; also that cancer feels heavier and is accompanied by more pain in the back; besides which a cancer tends to grow more spasmodically.

The PROGNOSIS is grave, although, of course, more favorable if no malignant growth is associated with it.

**Enchondroma of the Testes.**—There are two forms of cartilaginous tumors of the testis: (1) True enchondroma, a purely cartilaginous growth, which is extremely rare, and (2) mixed enchondroma, the comman variety, in which cartilaginous new growths are associated with carcinoma, sarcoma or cystoma.

PATHOLOGY.—*True enchondroma* usually appears in the testis as a central nodule of hyaline cartilage, hard and of a milky-white color on section. A number of these nodules are next seen separated by a fibrous matrix which contains blood vessels. When small, these masses of nodules look like grains of sago. The color may change to a bluish or creamy tinge when calcareous or fatty degeneration takes place in them. The masses of cartilage may be cylindrical or rod-shaped, and lie in spaces which are probably dilated lymph channels.

The tumor makes the testicle hard and heavy. The growth is usually ovoid, but may be irregular in shape in the later stages. Some spots are softer than others, but as a whole the tumor is harder than any other new growth of the testis.

The true enchondromata may undergo various kinds of degeneration, such as the fatty, calcareous, mucoid and cystic.

The tunica albuginea remains intact, although it becomes thinned by the growth within pressing upon it. The cavity of the *tunica vaginalis* is partly or wholly obliterated, and does not contain any fluid. The epididymis can be made out by palpation, unless the disease has advanced very far. The cord is rarely affected.

The cartilage originates, as Virchow proved, in the interstitial connective tissue of the organ, in a way somewhat analogous to that in which the periosteum becomes cartilage in the repair of fracture. This theory is supported by the fact that the center of the growth is usually found to be hyaline cartilage. The succeeding portions are of fibrous cartilaginous nature and the peripheral portion consists of fibrous tissue, containing numerous embryonic cells.

The pathological changes which are seen in *mixed enchondromata* correspond to the degree of the combination of cartilaginous and other tissues, which are usually malignant tumors and cysts. Little is known as to the true cause of this affection.

Symptoms.—At first the testis is slightly enlarged, and gives rise to dragging pains in the groin. After a period varying from five months to five years, the enlargement begins to assume certain definite characteristics. The swelling is ovoid, firm and at first more smooth, then nodular. There is no pain. The sensation of weight is increased. The veins of the scrotum are enlarged, but there is no enlargement of the cord. The growth is slow, requiring from four to six years to develop.

The growth very rarely becomes generalized; if so, it is probably a mixed type in combination with sarcoma.

Diagnosis.—The excessive hardness, slow growth and absence of involvement of cord are the principal features of this condition.

Prognosis.—The prognosis is always grave, especially if mixed enchondroma, such as sarco-enchondroma, is present.

Treatment.—The treatment consists of early removal.

**Lymphadenoma.**—This new growth, according to some writers, consists of hypertrophied lymphoid tissue; although, according to others, it is a variety of small round-cell sarcoma.

There is nothing characteristic in the clinical history of lymphadenoma. The growth develops and progresses rather slowly. Both testes are usually attacked, sometimes simultaneously. The treatment is removal.

**Fibroma.**—This type of new growth is very rarely seen in the testis. It is characterized by hardness and slow growth, and it may take years to develop sufficiently to cause the patient to seek advice. The tumor is not painful, but causes a dragging sensation along the cord; after it has enlarged, it becomes heavy, elastic and nodular. The consistency varies in different portions of the organ according to the amount of fibrous tissue present. The epididymis and cord are not involved.

The origin of the fibrous growth is either from the tunica albuginea or from the rete testis. The fibrous tissue is arranged in white bands which surround islands of parenchyma. On section, it is glistening, opaque and shows the wavy outlines of the fibrous bands. The parenchyma ultimately atrophies.

The only treatment is orchidectomy.

**Myxoma.**—This rarely occurs as a growth and only a few cases of it have been reported. It is usually combined with sarcoma, or other new growths of the testis.

Symptoms and Prognosis.—There is nothing in the clinical history or appearance of myxoma which would point to a diagnosis, as contrasted with other new growths. The tendency for it to associate with sarcoma makes its removal desirable.

**Myoma.**—There are two varieties of this tumor of the testicle: (1) The striated muscle-fiber myoma, and (2) the smooth muscle-fiber myoma.

The latter variety is derived from the muscle fibers of the epididymis or vas. The growth is very rare, as there are only a few cases on record.

**Osteoma.**—But two cases of this affection have ever been recorded. Its pathogenesis is not known. It may be a calcified form of one of the varieties of connective-tissue tumor.

**Teratoma.**—Dermoid cysts, containing such structures are skin, hair, etc., and in the more complicated forms, teeth, nails, bone and other tissues have also been found in the testes.

**Fungus or Hernia Testis.**—Etiology.—The principal causes of fungus testis are suppurative orchitis after injury, gangrene, gumma, tuberculosis or new growths. Some writers make a distinction between fungus and hernia testis. They classify the former as a protrusion of the substance of the testis through a portion of the scrotum, which has become involved in the process; and the latter as a protrusion of the testicle covered by its tunica through an opening in the scrotum (Fig. 898). We will consider here as fungus all protrusions having a fungous appearance.

Fig. 898.—Fungus of the Testis. (After Pean.)

Pathology.—There are two varieties of fungus. The glandular form contains seminiferous tubules and masses of granulation tissue. The false or parietal variety of fungus is simply composed of masses of granulations that grow from the albuginea or from the scrotum.

In tuberculous disease, the protrusion is of a yellowish color and granulating, while the edges of the ulcerated scrotum are hard and usually overlapped by the protruding growth as they contract.

In luetic testicle, the protrusion is a caseating gummatous growth.

The malignant fungus (fungus hematodes) consists of the protruded tissue of a neoplasm which has broken through the tunica albuginea and the scrotum.

In all cases, microscopic examination will reveal the presence or absence of seminiferous tubules in the protruding portion of tissue.

TREATMENT.—The treatment in all forms of malignant fungus is the removal of the affected testis. In syphilitic fungus, constitutional remedies should be used, and the ulcerating surface dressed with mild mercurial dressings. In tuberculous fungus, the granulations should be cauterized down to the surface, and a dressing of balsam of Peru applied locally. In bad cases orchidectomy is usually indicated.

## OTHER AFFECTIONS OF THE TESTIS

**Irritable Testis.**—This is characterized by a peculiar sensitiveness of the organ, or some one spot therein.

ETIOLOGY.—The etiology of irritable testicle is as yet unknown, and no particular pathological lesion has ever been made out on microscopic study. The most plausible theory is that this morbid sensitiveness is produced by lesions in the trophic nerves of the testis. It occurs in persons who are otherwise in perfect health, and is most frequently found during the period of greatest sexual activity. A short spermatic cord is thought to be the cause in some cases.

The sensitiveness, which is so great that the most gentle touch and even the ordinary contact of the underclothing, will produce a pain which is so exquisite that it seems almost impossible to endure. The pain is not continuous or dragging, as it is in neuralgia.

TREATMENT.—The treatment of irritable testis is a difficult problem. Regular moderate intercourse is an important hygienic remedy in these cases. A suspensory bandage well padded, of the variety shown in Fig. 891, should be worn during the attack. Ichthyol ointment fifty per cent is of great value, as are hot applications of lead-and-opium wash at night.

**Neuralgia of the Testicle.**—Under this term is meant the intense, noninflammatory pain which occurs in the testis without any lesion of the gland itself.

The true cause of neuralgia of the testis is unknown. It occurs in patients who have been subject to inflammations of the testis, to a hernia or to a varicocele. Gout and rheumatism also seem to be predisposing causes.

The pain may be acute, severe and shooting in character. It may be located in the testis, or may radiate into the thighs, groin or loins. In some cases, the pain is dull and dragging.

The acute paroxysms may be accompanied by spasmodic contractions of the cremaster, and by engorgement of the spermatic vessels. The diagnosis of neuralgia of the testis can only be made after excluding all the organic affections which have been described above.

The local treatment consists of the use of a support for the testis, of counterirritants, as nitrate-of-silver solution 1:8, ichthyol ointment fifty per cent or applications of cold or heat. General tonics and attention to hygiene are essential adjuvants.

## THE OPERATIONS OF EPIDECTOMY AND ORCHIDECTOMY

**Epidectomy.**—Epidectomy consists in making an incision through the side of the scrotum from just below the external ring along the course of cord to the junction of the epididymis and the testes (Fig. 899). In case a sinus is present, two elliptical incisions are made about it and the sinus area is removed; the finger is then hooked around the cord and the cord and testis are delivered (Fig. 900). An incision is then made along the outer side of the organ just in front of the epididymis corre-

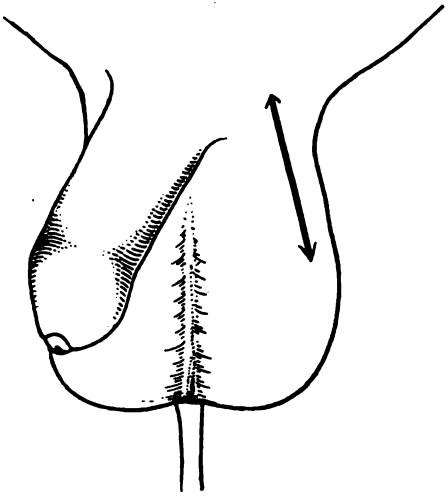


FIG. 899.—INCISION FOR EPIDECTOMY AND ORCHIDECTOMY.

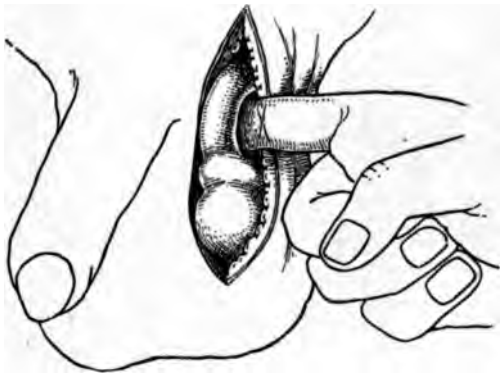


FIG. 900.—EPIDECTOMY. Shows the cord and testis being delivered by the forefinger of the right hand.

sponding to its length. The epididymis is pushed away by blunt dissection, with handle of scalpel, or preferably blunt curved scissors, beginning at the globus major minor, whichever is the easier. At the same time tracton is made on the epididymis and the tissues along its border are nicked with the scissors or knife when they do not yield (Fig. 901). In this way, the vessels going to the testis can be avoided as they lie on the inner side of the epididymis. When the part of the epididymis adjoining the testis on its outer side has been freed from it, the tissues on its inner side should be pushed away from it. The epididymis with its vas is then separated from the remainder of cord and removed, unless

the disease extends higher, in which case the cord is cut through in the inguinal canal. Bleeding points are sometimes encountered which are difficult to ligate on account of the density and smoothness of the testicular surface, in which case it is necessary to thread a ligature on a very thin round needle and pass it through the tunica albuginea and then ligate. The wound is drained, if septic, in cases of injury or tuberculosis; otherwise, it is closed without drainage.

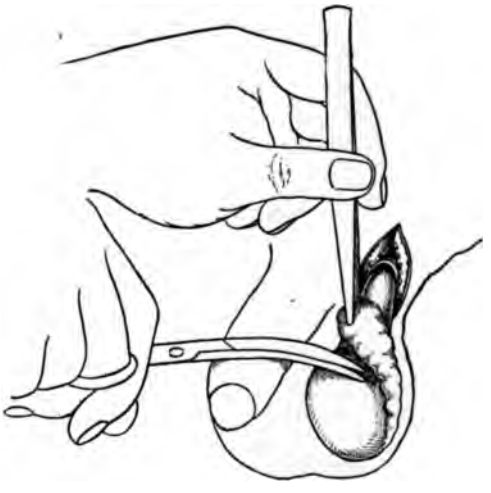


FIG. 901.—EPIDIDYMIS. Shows the epididymis being dissected away from the testis by blunt-pointed scissors.

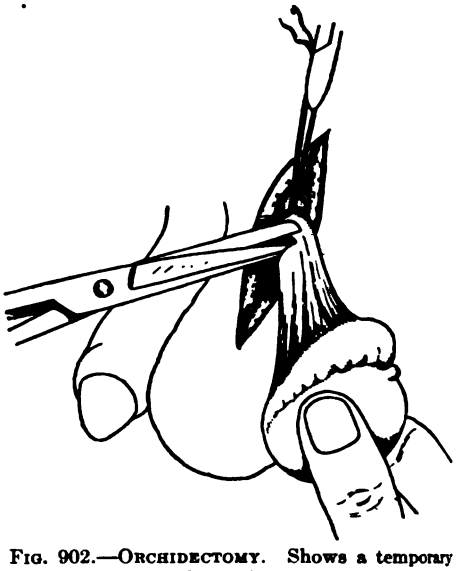


FIG. 902.—ORCHIDECTOMY. Shows a temporary ligature about the cord and the scissors cutting through below it. The arteries are then ligated individually and the temporary ligature severed.

**Orchidectomy.**—Having delivered the testis as in the epidectomy, a temporary ligature is placed around the cord just below the external ring and it is cut through one half an inch below this, thus completing the orchidectomy (Fig. 902). The treatment of stump now demands attention, as the ligature including all the tissues may give rise to neuralgic pains later through pressure on the nerves of the cord. It is, therefore, advisable to grasp the spermatic artery, the artery of vas and the cremasteric artery, and ligate them individually, after which the ligature about the cord can be loosened and removed in case there is no hemorrhage. If the cord is much involved, it is wise to open the external ring and remove as much as possible from the inguinal canal. In the case of a malignant growth or tuberculosis, any involvement of scrotum should be removed. If infection is present, as in case of suppuration of the testicle or cord or gangrene, a drain should be introduced up to the stump. The dressing and after-treatment should be the same as in any operation for a septic or aseptic wound.

# CHAPTER LXIX

## INJURIES AND DISEASES OF THE SPERMATIC CORD

**The Spermatic Cord** (*Funiculus Spermaticus*).—The spermatic cord is normally about 4 inches long and extends from the globus minor of the epididymis to the internal inguinal ring.

The spermatic cord contains the spermatic duct or vas deferens, extending from the epididymis to the urethra with its artery from the superior vesical and its vein emptying into the vesico prostatic plexus; the spermatic artery from the aorta and the pampiniform plexus composed of the spermatic veins which emerge from the back of the testes and epididymis and unite to form the convoluted mass in front of the cord, then to form three or four veins below the external abdominal ring, then two and finally one which empties on the right side into the vena cava and on the left into the renal vein; the spermatic nerve plexus; the deferential plexus of the sympathetic nerve; lymphatics emptying into the glands about the aorta; loose fibrous and fatty tissue and the cordlike remnant of the vaginal (funicular) process of peritoneum, the ligament of Cloquet. The infundibuliform process of the transversalis fascia ensheathes the contents, and over this lie the cremasteric and intercolumnar fascias and the cremasteric artery and vein. The cremasteric artery coming from the epigastric gives off branches to the cremasteric muscle and fascia on which are the genitofemoral nerve and the external spermatic veins. The spermatic artery meets that of the vas at the internal ring, extends through the canal in front of it and sends branches to the testes and epididymis, anastomosing with the artery of the vas and the cremasteric. There is likewise an anastomosis of the veins favoring a reëstablishment of the circulation after the removal of the pampiniform plexus.

**Hematocele of the Spermatic Cord.**—This is a rare affection.

Etiology.—It is due to blows or falls, causing a rupture of the veins and a hemorrhage into the cord; or it may follow an operation for hernia or varicocele. It may be diffuse or circumscribed.

Pathology.—A fusiform swelling results from the extravasation of blood into the tissues of the cord, which, in cases caused by direct violence, may be obscured by the effusion of blood into the surrounding cellular planes. The tumor may extend from the testis to the internal ring or beyond, thus filling the inguinal canal in diffuse cases. In circumscribed cases, it forms a small

tumor which bulges out the fascia of the cord at some points. A clot may be found on opening the circumscribed hematocele, or simply decomposed grumous blood. In one case, returning a month after a hernia operation, I found a tumor the size of a walnut which contained blood not in the clot form. In other cases, that I have had after varicocele and hernia, which were very few in number, they contained a clot and occurred shortly after the operation.

SYMPTOMS.—There are no symptoms but a feeling of discomfort and some distention; although, if the result of a severe blow, there may have been symptoms of shock, nausea and vomiting, sweating and weakness at the time of injury.

TREATMENT.—The treatment is the same as for hematocele of the testis. In recent cases, where there is but slight effusion, there should be (1) rest in bed, (2) applications of ice, or (3) hot or cold lead-and-opium wash. In case sepsis develops the hematocele should be opened and dressed antiseptically.

**Tumors and Cysts of the Cord.**—LIPOMA is the most frequently met with. It is often of large size, one case weighing twenty pounds. It is generally, however, very small. It occurs in the loose cellular tissue in close connection with the cord, usually in the inguinal canal; but it may extend into the scrotal portion, or it may extend between the different component parts of the cord, rendering the removal without injuring its structures difficult. Sometimes the part is hard and lobulated, resembling malignancy. It may also undergo fibroid changes as in the specimen of Fig. 903, removed during a hernia operation and shown at the New York Academy of Medicine. The tumor was four inches long and an inch in diameter. It may also undergo myxomatous degeneration. It is frequently associated with hernia and is probably a predisposing cause to it.

FIG. 903.—FIBRO-MYOMA OF THE CORD, SPLIT. (Author's case.)

*Symptoms.*—It is painless, of slow development, of soft consistency, irregular in shape and lobulated.

*Diagnosis.*—It principally resembles omental hernia, from which it is diagnosticated by being irreducible and having no impulse on coughing.

MYOMA, SARCOMA AND CARCINOMA are also mentioned as occasionally occurring, but none have as yet come under my observation.

TREATMENT OF TUMORS.—As far as small uncomplicated fatty tumors of the cord are concerned, no treatment is indicated and they should be left alone. In case they cause distress, they should be removed. If they occur with hernia, they should be removed at the time of the herniotomy. In case an induration is felt or pain develops, an incision should be made and they should be removed; or if there are signs of malignancy, both the orchid and cord should be

removed. In the case of a malignant growth of the cord independent of fatty tumors, both the cord and testis should be immediately removed.

**Cysts of the Cord.**—Encysted hydroceles of the cord are practically the same as cysts. They have already been described in the chapter on Hydrocele. The cysts are situated between the peritoneal cavity and the tunica vaginalis either in the inguinal canal or just below it; they may be single or multiple.

Fig. 904.—An Opened Dermoid Cyst after the Removal of Its Semisolid Contents, Showing Hair Growing from Its Interior.

Dermoid Cysts.—Dermoid cysts of the cord are exceptionally rare. A case of this kind was recently brought to the clinic by Dr. C. R. O'Crowley, of Newark. The patient was a barber, twenty-four years old. He applied for treatment, believing that he had a hernia, as he had noticed four months before a painless tumor just below the external ring in the cord which had been increasing gradually in size. Examination showed an oval tumor the size of a pullet's egg. It had a cystic feel, dull on percussion, no impulse on coughing and no translucency. A needle inserted drew out some semisolid cheesy fluid and one hair. The growth was removed and proved to be a cyst containing cheesy material and hair (Fig. 904).

**Funiculitis or Inflammation of the Spermatic Cord.**—There are three varieties of funiculitis.

Gonococcal Funiculitis.—This is due to an extension of a blennorrhagia from the posterior urethra, along the vas deferens to the cord; and it is usually the only part of the cord that is involved. The pathology of gonococcal inflammation of the vas deferens has already been considered under Gonococcal Epididymitis. The vas deferens may be inflamed in any part of its course. When affected nearer the urethra, the favorite sites are its ampulla or just before it turns to pass through the internal ring into the inguinal canal. These localized inflammations are liable to give rise to permanent occlusion of the canal.

Phlegmonous Funiculitis.—Inflammation of the vas may give rise to cellulitis of the cord, although this is rare, in which case it would be of the phlegmonous type. Phlegmonous funiculitis is also due to traumatism or it may be due to a septic phlebitis.

*Symptoms.*—The symptoms of phlegmonous funiculitis are those of cellulitis: A feeling of pressure, fever and sweating. The cord is enlarged, tender

and reddened, a tumor appears resembling a bubonocele. The pain varies in degree and may be intense.

The *treatment* at first should be counterirritation with the tincture of iodin; but in case the inflammation increases, poultices should be applied, and if pus forms, it should be evacuated.

SUPPURATIVE FUNICULITIS may be secondary to a suppurative epididymitis. A patient with no venereal history entered my service in the City Hospital some years ago with a hernia on the right side, and also an enormous testis and a cord an inch in diameter. The acute condition had followed instrumentation two weeks before. His temperature was 104° F.; pulse, 128; nausea, slight hiccough, abscess pointing anteriorly.

*Operation.*—Incision over the external ring showed an enlarged inflamed cord and a hernia over it. Pus escaped from the cord on opening it. An incision over the front of the testis opened an abscess leading into the globus minor. The cord and epididymis had evidently been involved throughout their entire length in the inflammatory process.

Another form is termed SEROUS FUNICULITIS and includes diffuse and encysted hydrocele of the cord, which have already been considered in the chapter on Hydrocele.

**Tuberculosis of the Cord.**—ETIOLOGY.—Tuberculosis of the cord is always an ascending process from the epididymis.

PATHOLOGY.—The vas deferens is the part of the cord principally involved. It is thickened, sometimes the size of a thin slate pencil. Scattered tubercles are felt on its periphery. Sometimes there are well-marked exudates about it, whereas in other cases, cheesy areas are found in its walls. Abscesses are occasionally present with considerable accumulation of pus in the inguinal canal, and an involvement of the interstitial tissue of the cord.

SYMPTOMS.—There is a sense of stretching and a dragging in the groin and a pain in the cord, especially where no support is worn, or there is perhaps a swelling and tenderness in the groin.

Examination shows a vas that can be palpated through the cord above the testis. It has a stiff and hard feel, sometimes nodular. It can also at times be felt per rectum. The patient may have a low grade of fever. A tumor, varying in size from a pea to a pullet's egg, may be felt in the groin.

DIAGNOSIS.—This is generally based on evidences of tuberculosis elsewhere, usually in the epididymis, in which case there are usually nodules or sinuses present. A thickening with or without nodules of the prostate or seminal vesicles may also be felt, or a cavity may be outlined in the prostate. Tuberculosis may also be found in other parts of the body.

TREATMENT.—Improve the general condition by fresh air and hygiene. A suspensory bandage should be worn. Creosote ♏ iij and syrup. ferri iodidi ℥ss should be given three times a day internally, and iodid-of-lead ointment ex-

ternally. If an abscess develops, it should be opened. I have had two cases that have developed an abscess in the inguinal canal, which I will quote, as they are of interest.

Illustrative Cases.—*Case I.*—Laborer, thirty-eight years of age. He had urethritis three years before, which still existed as a gleet. Two years ago he had typhoid fever. Two months ago he had chills and fever and a pain in the right inguinal region followed by the appearance of a small lump that had continued to grow until, on his entering the hospital, it had reached the size of a hen's egg. He had a hard mass in each globus major of the testis, an enormous seminal vesicle on the right side and a fluctuating abscess on the right lobe of the prostate, which ruptured, leaving a deep cavity.

An incision was made in the groin, the inguinal canal opened and two ounces of pus and débris evacuated. The abscess had originated in the vas deferens and was tubercular. It was a part of a tuberculous process of the genital system.

*Case II.*—This case is a rare one.—A laborer entered Columbus Hospital on the medical side. It was noticed that he was discharging pus from his umbilicus. I passed the probe through the umbilical opening and found there was a long sinus extending to the region of the appendix. Thinking that it was a discharging sinus from an old appendicular abscess, I advised an operation and made an incision over the site of the appendix down to the end of the probe and found that the sinus was extraperitoneal. Then, probing again from the iliac opening, I found the probe went into the inguinal region, and, on making a second incision, I opened over the inguinal canal and discovered that the focus of suppuration was a tuberculous vas deferens in the inguinal canal.

**Lues of the Spermatic Cord.**—We have stated, in speaking of lues of the testis, how rare it is to find the epididymis involved and how still less frequent is the presence of tertiary lesions in the cord.

Gummata of the cord have, however, been described by a number of writers. Balme mentions three cases reported by Vidal de Cassis, Malgaigne and Fournier respectively; Lancereux, Broca, L'Hommice, Helot, Reclus and Verneuil have also reported cases of gummatous infiltration of the vas deferens. In all of these instances, the condition was secondary to testicular lues. Kocher mentions a case of gumma of the vas deferens where there were two tumors, one the size of a goose's egg and extended into the iliac fossa. In Verneuil's case, the tumor was very large.

**Varicocele.**—Varicocele consists of an enlargement of the veins of the spermatic cord. It occurs principally in the pampiniform plexus, which is the mass of veins situated in front of and above the testis that ends in the spermatic vein. It is present in ten per cent of adult males, and occurs on the left side in ninety per cent of the cases.

ETIOLOGY.—The predisposing causes are the emptying of the left spermatic vein into the left renal at right angles; the passing of the left spermatic vein beneath the sigmoid flexure; and also because the veins are long and their valves insufficient to support the column of blood. The active causes are long-standing sexual excitement without gratification and constipation giving rise to fecal accumulations pressing on the left spermatic veins. Tumor of the kidney is another cause of varicocele.

SYMPTOMS.—*Acute Varicocele.*—Some authors speak of an acute varicocele giving rise to local pain and distress, causing considerable alarm, which attacks come on suddenly and are due to fatigue, cold, or local injury, principally on the left side. They are cured in a few days by rest, suspension, anodyne lotions and laxatives. This condition must not, however, be confused with the chronic condition under consideration.

*Chronic Varicocele.*—Symptoms of chronic varicocele come on insidiously. There is an uncomfortable dragging feeling in the groin or back, especially after fatigue. The patient may have slight pains radiating to groin, testis, back or thighs. These pains are aggravated by unrelieved sexual excitement. Neurasthenic symptoms may also be present, lack of desire to do mental or physical work, tiring easily, uneasiness, nervous feelings, depression and perhaps headache. These neurasthenic symptoms are common in young unmarried men who have disease of the genital tract, or pressure upon any part of it, or interference with its blood supply. They are very much alarmed about their condition and afraid of impotence. The size of the varicocele has nothing to do with the degree of the symptoms, as men with enormous varicocele may have no symptoms, whereas others with small varicoceles may be very much affected.

EXAMINATION.—This shows the veins to be more or less enlarged, especially those of the pampiniform plexus in front just above the testis, which often feel like a bunch of worms. The cord is usually elongated and the scrotum may be thinned and have a dusky hue. The veins of the scrotum may be also enlarged. A careful examination of the testis often shows it to be smaller and softer than usual—in other words, rather flabby—although these conditions are never sufficient to account for the hypochondriasis or neurasthenic symptoms of the patient. The largest varicocele that I have ever seen was dependent on a tumor of the kidney on that side and disappeared after the kidney had been removed.

DIAGNOSIS.—Varicocele is sometimes mistaken for hernia, especially the form consisting of a thin piece of omentum that so frequently slips down in front of the cord. I have seen cases operated upon by eminent surgeons for varicocele, when, on opening the sac, this little piece of omentum has been seen. When a patient with varicocele coughs, the mass tends to spring up; whereas in hernia it tends to spring downward. In a reclining position they

are both reduced; but if the finger is kept on the ring, and the patient is instructed to stand up, the hernia will be kept up while the varicocele tends to fill again.

Prognosis.—The prognosis of varicocele is interesting. It seems strange that a patient with such a slight ailment should not be admitted to the city fire or police departments, or to our army or navy until they have been successfully operated, as a man with varicocele may be very strong and enduring physically. The most unfavorable symptoms, to my mind, in varicocele cases, are the neurasthenic and hypochondriacal variety, which are altogether out of proportion to the trouble, and yet tend to make a man unfit for a position where so much depends on being free from all forms of nervousness.

Patients with varicocele are usually cured by operation, but not always. Sometimes they are made worse, as painful symptoms have followed the operation which were not present before it. So far, I have never to my knowledge had such a result, although I have had cases operated on by others come to me for a second operation to be relieved of the pain following the last operation. The testis sometimes becomes gangrenous or sloughs after varicocele. I had one such case in which I had to perform orchidectomy afterwards.

Patients who have or have had tuberculous epididymitis should not be operated upon, as it tends to aggravate the tuberculous trouble.

Generally, however, the operations for varicocele are most successful, and it has been surprising to see young men of eighteen to twenty years of age, who were thin, nervous and apprehensive, rapidly improve, take on weight and lose their nervousness after the operative procedure. I have made it a point, however, to tell all patients coming to me for operation that, whereas it is a simple operation and will probably be successful, mishaps occasionally occur and they may have a painful condition result or may even lose the testis.

Treatment.—There are two methods of treatment, the palliative and the radical.

*Palliative.*—Proper regulation of bowels, avoidance of sexual excitement, badly fitting trousers and occupations requiring prolonged standing. The patient should take moderate exercise in the open air, salt-water baths if possible and should douche the skin overlying the dilated veins daily with cold water and wear a properly fitting suspensory bandage. This treatment is indicated when the varicocele is of moderate size, when the testicular nutrition is not interfered with and when neurasthenic symptoms are not pronounced.

*Radical.*—If the patient complains of dull aches and pains, and loss of sexual power and ascribes it to his varicocele and desires an operation, it should be performed. There is very little danger accompanying such an operation and the patient's mind is then at ease.

Subcutaneous ligatures were formerly used and occasionally are at present. The patient is required to spend but a few days in bed. Sometimes the opera-

tion is followed by a stitch abscess, but it usually heals readily. I have long since given up the subcutaneous operation, as I think that the open operation as performed at present is far superior to it.

For a number of years I operated on varicocele through a scrotal incision and, although my ultimate results were good, I had a large number of stitch abscesses in my hospital cases due to the reason that most of the patients came from my clinic and had pus, either in their urethras or their urine. I accordingly resorted to the high operation, and since then my results have been perfectly satisfactory.

FIG. 905.—OPERATION FOR VARICOCELE. Showing the incision retracted and (1) the cord, (2) Poupart's ligament, and (3) the external ring exposed to view.

The technique is as follows: Ether anesthesia. An incision one and one half inches long from the spine of the pubes parallel to Poupart's ligament toward the anterior superior spine of the ileum down to the aponeurosis of the external oblique muscle. The wound is then retracted and wiped with gauze until the tissues are clearly defined, that is, Poupart's ligament, the sides of

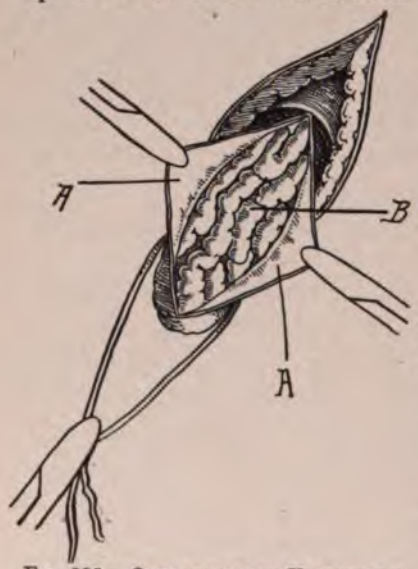



FIG. 906.—OPERATION FOR VARICOCELE. The sheath of the cord is opened and the veins exposed to view. *A*, sheath of cord. *B*, pampiniform plexus.

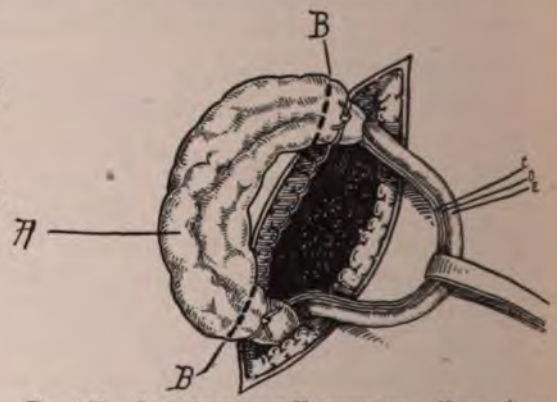



FIG. 907.—OPERATION FOR VARICOCELE. Shows the vas deferens with its artery and vein separated from the remainder of the cord.
*A*, Pampiniform plexus to be excised.
*B*, Lines of section. *D*, Artery of vas.
*C*, Vein of vas. *E*, Vas deferens.

the external ring and the cord coming through it (Fig. 905). The tip of the forefinger is then placed on Poupart's ligament and is hooked under the

cord just below the external ring, and it is then delivered and held up by a piece of gauze placed beneath it. The sheath of the cord is then opened and its contents exposed (Fig. 906). The vas deferens with its artery and vein are separated from the remainder of the cord and the large prominent veins of the pampiniform plexus are freed and ligated at points varying from one and one quarter to three inches from one another, depending on the length of the cord (Fig. 907). The material used is No. 1 chromic gut. A section between the ligatures, usually one to one and one half inches long, is then excised and the cut edges are then approximated and united. A chromic-gut suture is also passed

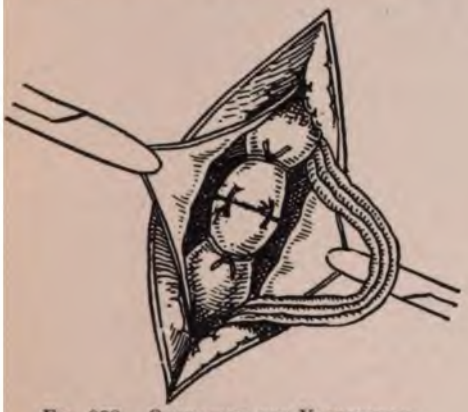


Fig. 908.—Operation for Varicocele. Shows the two segments of the cord united.

Fig. 909.—Operation for Varicocele. Shows the sheath of the cord closed.

through each side of the united segments to keep them better in place (Fig. 908). The incision in the sheath of the cord is closed by plain catgut and then the external wound (Fig. 909).

An ordinary surgical dressing is placed over the wound, which is held in place by a spica bandage. A bridge of adhesive plaster five inches wide is placed across the thighs in front of the perineum for the testes to rest upon. The patient leaves the hospital in a week and wears a suspensory bandage until the segments of the cord have firmly united. A lump forms at the point at which the upper segment joins the lower segment, which slowly disappears in three months or less.

The question is frequently asked me how much of the cord I remove. I usually take out a section of the pampiniform plexus alone; sometimes the spermatic artery as well. I am very careful not to injure the nerves. The spermatic artery can be cut without interfering with the nutrition of the testis. If the spermatic artery and that of the vas were both cut, there might be gangrene, atrophy or sterility of the testis on that side, and therefore great care must be taken not to cut away too much of the cord.

# CHAPTER LXX

## SEMINAL VESICLES

As the scope of this work is urology, I will consider the diseases of the seminal vesicles principally from the point of view of bladder disturbances, and emphasize as much as possible the urinary symptoms.

The various conditions to be considered are anomalies, injuries, syphilis, tumors, cysts, concretions, inflammations and tuberculosis.

The opinion is common that the seminal vesicles and their diseases have only recently been understood; but this is not a fact, as the organs were first described by Berenger de Carpi in 1523 and studied from the standpoint of pathology by Baillie in 1815. Besides the work of these men, there are three classical monographs dealing with the subject written long ago by Albers, Faye and Guelliot. For more recent literature on the subject, the reader is referred to the works of Fuller, Zueltzer, Jacobson, Reclus and Kocher.

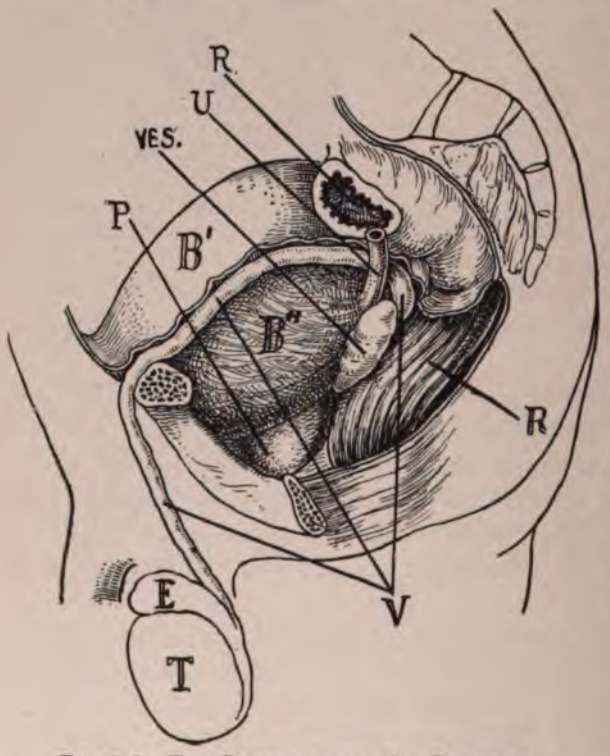



FIG. 910.—THE COURSE OF THE VAS DEFERENS.

*V*, vas deferens. (Note its course from the epididymis to the point between the rectum and vesicle before it becomes the ejaculatory duct.)
*R*, rectum.
*U*, ureter.
*P*, prostate.
*E*, epididymis.
*Ves.*, seminal vesicle.
*B'*, bladder with peritoneum.
*B''*, bladder without peritoneum.
*T*, testis.

### ANATOMICAL CONSIDERATIONS

The vas deferens with its artery and vein, having left the composite spermatic cord at the internal inguinal ring, will be considered

ıgh the remainder of its course with the seminal vesicle. It extends nd the side of the bladder and then down to its base, passing in front of ıreter and to the inner of the seminal vesicle which it is connected by ıct (Fig. 910). The ı of the vas with the nal vesicle forms the ejac- ıry duct that passes ıgh a section in the pos- r part of the prostate empties into the prostatic terior) urethra, forming enito-urinary sinus. The ng of the ejaculatory with the urethra unites genital and the urinary s and forms the genito- ary tract (Fig. 9, Vol. I). The vas deferens in its e course, as well as the inder of the genital tract, ıtside of the peritoneum.

Fig. 911.—Relation of the Seminal Vesicles to the Vas on One Side and to the Trigone of the Bladder and the Ureter on the Other. (From Albarran.)

vas is covered by the posterior layer of deep pelvic fascia in the part s course to the base of the bladder that also covers the seminal vesicle.

12.—The Recto-vesical Fold of Peritoneum. (From Wallace.)

The seminal vesicle is situated to the outer side of the vas deferens and usually over the posterior surface of the ureter (Fig. 911). It is at all times extraperitoneal, that is, below the recto-vesical fold of the peritoneum. Fig. 912 shows recto-vesical fold of peritoneum. The seminal vesicles and the ampulla of the vas deferens are situated just behind the trigone of the bladder, its more sensitive portion, and consequently any abnor- condition on the part of the vesicle is liable to give rise to disagreeable ves- disturbance. Fig. 911 shows the relative position of the trigone of the der and the ureter to the vas deferens and the seminal vesicles.

## ANOMALIES OF THE SEMINAL VESICLES

These anomalies are rare and usually affect only one side of the body. Absence of the vesicle on one side bears no constant relation to that of the corresponding testis, as it may be present with part of the contiguous vas deferens in an atrophied condition.

Unilateral absence of one seminal vesicle is very rarely associated with total absence of the genital apparatus of the same side; and even when the vesicle and the kidney on one side are both absent, the testis on that side may appear normal, though the epididymis and vas deferens are atrophied.

Both seminal vesicles may be absent when the rest of the genital apparatus on both sides is normal. Both seminal vesicles may be absent, combined with other anomalies, such as the absence of one or both testes, intra-abdominal retained testes, hermaphrodism; absence of the prostate; or anomalies of the bladder, rectum or penis. Both seminal vesicles may also be absent in combination with anomalies at the prostatic end of the vasa deferentia, such as fusion or obliteration; or with anomalies of the two ejaculatory ducts, such as absence or fusion into one; or when one duct has an abnormal entrance in the urethra, as when it does not open until it reaches the balanic urethra; or when the ureter and the ejaculatory ducts have a common opening into the bladder.

Again both seminal vesicles may be fused into one; or one or both seminal vesicles may be doubled (anomaly by excess).

## INJURIES OF THE SEMINAL VESICLES

Owing to their anatomical relations, injuries of the vesicles are extremely rare and are usually caused accidentally in the course of surgical procedures in the perineal region. When both the ejaculatory ducts are injured, the probability is that sterility will result.

## SYPHILIS OF THE SEMINAL VESICLES

It is a disputed question if the seminal vesicles are ever the seat of syphili[redacted] lesions, and, for lack of more confirmatory proof, it will not be considered.

## TUMORS OF THE SEMINAL VESICLES

**Carcinoma.**—Carcinoma of the vesicles is very rare and, when such a ca[redacted] does occur, it is almost always secondary to malignant growths of the tes[redacted] or prostate, principally of the prostate. But two primary cases have been [redacted]corded, one by Labbé and the other by Gay of Boston.

Examination of most of the secondary cases showed the prostate to be [redacted]

volved in one mass of cancerous tissue with both vesicles. The disease occurred in old men. The chief symptoms were dysuria, hematuria, pain in the loins and the presence of prostatic and vesicular enlargement.

The treatment should be similar to that of extracapsular carcinoma of the prostate, when urination is very much impaired. (See Fig. 307.)

**Sarcoma.**—Sarcoma of the seminal vesicles is very rare and but two cases have been reported, one by Coupland and another by Zahn, both of which were primary in the vesicle.

## DILATATIONS AND CYSTS OF THE SEMINAL VESICLES

**Dilatations.**—Dilatation occurs as a result of a chronic inflammation, which produces a partial or complete stenosis of the ejaculatory ducts. It is frequently mistaken for a cyst. The obliteration of the ejaculatory duct may lead to aspermatism on that side, although such an obliteration does not necessarily result in dilatation.

There are two kinds of dilatations of the vesicles. In one, there is but one cavity, which consists of the whole vesicle, or a diverticulum from the main cavity. The second variety comprises cysts which are formed of a number of cavities connected by one membranous wall. It is probable the latter results from the dilatation of a number of diverticula and the obliteration of their openings into the main cavity. The contents is usually yellow, transparent or slightly turbid and viscid.

**Cysts.**—Cystic degeneration of the seminal vesicles is a rare affection. English distinguished four varieties of cysts which may be present on the posterior wall of the bladder. (1) Single cysts in the median line of the posterior wall of the bladder and (2) unilateral cysts connected with the vas deferens. These two varieties depend upon the malformations of the Mullerian duct. (3) Cyst of the sinus pocularis in the prostate, which is an abnormality of the Wolffian duct. (4) Cystic degeneration of the seminal vesicles. This last variety depends upon chronic inflammatory processes in the vesicles and is nearly always bilateral.

Hydatid cyst of the seminal vesicles has been reported in several cases, but I do not know of anyone who has verified this by autopsy. In 1904, I reported a case of cyst of the seminal vesicle in a July number of the London *Lancet.* The consensus of opinion in the Society of Dermatology and Genito-Urinary Surgery, before whose members I presented the patient, was that it was a cyst of the seminal vesicles. Since then I have had a patient with a hydatid cyst in a similar position, the study of which has led me to believe the former case was also a hydatid and that hydatid cysts do not originate in the seminal vesicles, but from the space between the rectum and the bladder, and that they are associated with the vesicles only by their close relationship.

## CONCRETIONS OF THE SEMINAL VESICLES

As in other parts of the genito-urinary tract, the seminal vesicles are sometimes the seat of masses of hardened secretion, which, under the influence of certain chemical processes, become veritable vesicular calculi. These concretions may impede the flow of semen, and therefore in some cases result in aspermatism.

**Etiology and Pathology.**—The exact cause and the method of formation are not very well known. As these concretions grow larger, their chemical composition is altered and their color is usually brown, owing to the presence of pigment particles. Spermatozoa are also present in these concretions. They are surrounded by constantly growing layers of salts of calcium phosphate and carbonate. Their formation has been attributed to a stenosis of the ejaculatory duct, and, as they are found usually in men of advanced age who have not exercised the sexual function for a long time, it seems that "stagnation" of the seminal fluid, with consequent inspissation, plays a rôle of some importance in their etiology.

They are usually multiple and of small size, as that of a tomato seed.

Bechmann reported a case in an old man in whom the concretion was the size of a cherry, irregular in outline and on section showed three strata of different colors. It was situated in a dilated ejaculatory duct.

I have noticed these concretions in two or three cases, all old men. One of them died of some intercurrent trouble, while in the hospital, and on autopsy the specimen was removed. It was about the size of a French pea, of a grayish-brown color and of firm consistence. It was not examined chemically or microscopically. I have a patient now, thirty-two years of age, with a concretion in his right vesicle that does not move when massaged. It is the size of an American pea, but gives rise to no symptoms.

**Symptoms.**—The chief symptoms are sexual irritability, spermatic colic or aspermia. Urination is often painful and there is frequently vesical tenesmus. The most characteristic sign is a pain in the region of the seminal vesicles occurring during and after coitus without ejaculation. Usually, however, there are no symptoms and no aspermia, as the stone is in one of the compartments.

The **diagnosis** can be determined only by feeling the concretion on rectal examination.

**Treatment.**—A sound may be passed into the bladder and the softer stones crushed with the finger in the rectum, pressing them against the instrument. The harder ones are sometimes dislodged by stripping the vesicle and making counterpressure in the groin.

## SEMINAL VESICULITIS

In considering the subject of seminal vesiculitis, we will divide it into two classes—acute and chronic. The hyperacute cases are rare and most of the cases are of the subacute variety. These latter cases are very similar to the chronic cases in their symptomatology, except that the symptoms are slightly more marked, the history of the duration of the disease is shorter and they lack the nervous and neurasthenic symptoms.

**Etiology.**—Seminal vesiculitis may be primary, that is, due to certain indirect predisposing causes, such as sexual excess, withdrawal during coitus, bicycle riding and traumatisms to the posterior urethra caused by instrumentation that produces a posterior urethritis plus infection by some pus-producing germs, as the colon bacillus, streptococcus and staphylococcus. It is generally secondary to a posterior gonococcal urethritis.

**Pathology.**—ACUTE SPERMATO-CYSTITIS is characterized by the usual lesions of an acute exudative inflammation, varying in degree from a very mild inflammation to a brawny indurated swelling. The vesicles are enlarged. On section, the wall of the organ is found to be thickened, the mucosa swollen and congested and its folds enlarged, while the alveoli may appear diminished in number. Pus may be seen on the inner walls of the inflamed vesicles. An abscess is very rarely present. The contents of an inflamed vesicle consist of the altered secretion of the part, together with the products of exudative or suppurative inflammation. In severe cases, the contents are sometimes thick and bright red, resembling currant jelly, or rusty brown; but in the presence of suppuration, they are muco-purulent or purulent and yellow in color. They contain pus cells and fat droplets, usually also gonococci or one of the pus-producing organisms such as streptococci, staphylococci or the colon bacillus, cast-off epithelia, débris of connective-tissue cells, fragments of spermatozoa and globulin.

The CHRONIC FORM of vesiculitis is either a continuation of an acute attack, the lesions gradually merging from one stage into the other, or the lesions are productive from the onset, with a slight thickening of the mucosa and underlying tissues, owing to the formation of new connective-tissue cells. The changes are more pronounced, the vesical walls are thickened, indurated and sclerosed. The mucosa is thickened and hypertrophied at first; but later it may become atrophic, owing to the contraction of the new connective tissue about the blood vessels and lymphatics. On this basis we may divide the chronic form of vesiculitis into the catarrhal and interstitial. The first is accompanied by a hypertrophy of the mucous membrane.

The interstitial is so termed because it is characterized by the overgrowth of connective tissue, as a result of which the mucosa is deprived of its normal blood supply and becomes atrophied. In a further advance of this interstitial

condition, the whole organ shrinks and atrophies. There may also be narrowings and dilatation in the vesicles, or calcareous deposits in their walls.

**Acute Vesiculitis.**—SYMPTOMS.—*Acute Seminal Vesiculitis.*—The symptoms of acute seminal vesiculitis are general and local. The *general* are those that accompany any acute inflammatory condition, namely, fever, which although usually very slight and not over 99° or 101° F., may reach as high as 104° F.; the pulse rate is increased in proportion and headache, constipation and a general feeling of malaise are also present. Such acute attacks are very rare, as nearly all acute vesiculitis is very mild or subacute.

The *special symptoms* of acute seminal vesiculitis are referable to the urinary and genital tracts and to the nervous system.

Troublesome erections may occur at night, sometimes, though rarely, accompanied by a dull pain high in the perineum and an increased sexual desire. The erections may be sufficiently persistent to interfere with the patient's rest and sleep. He may have frequent nocturnal emissions, accompanied by pain and sometimes stained with blood—hematospermia. Pus may be found mixed with the semen—pyospermia. There is generally no discharge with an acute attack of seminal vesiculitis, unless it is associated with an antero-posterior urethritis.

The urinary symptoms are bladder fullness, feeling of inability to empty the bladder, frequency, burning, tenesmus, dribbling, polyuria and pain. There may be a feeling of bladder fullness, especially noticed in the suprapubic region. This feeling of fullness is not wholly relieved by passing urine, leading the patient to think that he has not fully emptied his bladder, and that there is still a certain residuum that he cannot pass. This feeling of fullness may be accounted for by pressure of the dilated vesicles on the trigone of the bladder, which sensation is not relieved as it is normally by passing the urine. There is also at times a feeling of stiffness in the neck of the bladder after urinating, as if the bladder wall could not fully contract, probably due to the stiffened unyielding vesicles which extend out on the bladder wall like a pair of brackets converging to the vesical neck and perhaps adherent to the bladder wall. This has been spoken of by patients in describing the sensation as a "chordee of the bladder."

Increased frequency of urination is usually noticed during the day and the patient may also be obliged to rise at night to void. The urine may be high-colored and of high specific gravity. Frequently, however, it is of low specific gravity, almost colorless, a form of nervous polyuria. The polyuria is peculiar and it is not unusual for a patient to pass his urine at intervals of an hour and a half during the day, voiding each time from eight to twelve ounces; then, after such another interval, he may to his surprise pass sixteen ounces or more. Such a polyuria may be due in part to the increased consumption of water, or to the alkalines often used by these patients to relieve the ardor urinæ.

There is, however, no doubt that they are passing a larger amount of urine of lower specific gravity than they would in a state of health with the same amount of water and alkalines. This may also be due to a pressure or adhesions of the engorged vesicles on the distal ends of the ureters, causing reflex kidney stimulation. (See Fig. 911 and Fig. 3, Vol. I). In the later stages there may also be some leakage into the posterior urethra, which is passed out in the urine, giving it a frothy appearance.

The burning and tenesmus that sometimes follow urination may be due to an associated posterior urethritis, or also to the irritation of the bladder from the inflamed vesicles lying beneath the neck. Dribbling following urination, if it occurs in these cases, would consist of the leakage of a few drops, due to the disturbed function of the vesical neck.

Pain occurs principally deep in the perineum, in the groin and in the glans penis. It may also, though less often, be noticed in the testes, the sacro-iliac region, the back, deep in the pelvis, thigh and loin. It may be connected with the act of micturition or defecation, or may be independent of it. The pain in the perineum is sometimes described as tearing. It may be paroxysmal, but is more often of a dull nature. The pain in the groin is reflected down the cord and is usually of a dull character and increased by sudden movements. The uncomfortable sensation of bladder fullness is a common symptom.

The pain in the testis and in the glans penis is a reflected pain in the first case along the cord, and in the second along the urethra, but it is rarely marked. In the testes, it is seldom more than a heavy feeling; whereas in the penis it may show itself simply as a slight itching or tickling about the meatus or glans.

*Subacute Seminal Vesiculitis.*—It must not be supposed from the recital of this long list of symptoms that they are all found in any one case of acute vesiculitis. The inflammation is generally of a mild subacute form, giving rise to but few symptoms, such as backache and a feeling of malaise, a slightly increased frequency of urination by day, a slight feeling of discomfort or tickling in the perineum or glans, or a slight sense of bladder fullness, with a general indefinite impression that all is not quite right.

Course.—Generally only one of the vesicles is attacked at a time, but the other may be involved later. The symptoms begin to disappear as soon as treatment is begun. The attack usually terminates by resolution in from two to three weeks, or the inflammation may become chronic. A recurrent form of this affection, often accompanied by a slight morning discharge, formerly occurred among bicycle riders even when their urine was clear and no localized urethral inflammation could be found. Abscesses are very rare and usually discharge through the ejaculatory ducts.

Complications.—The complications of acute seminal vesiculitis are perivesiculitis, local or general peritonitis, prostatitis, funiculitis and epididymitis.

*Perivesiculitis* (Pelvic Cellulitis).—This does not occur frequently. When it takes place on one side the vesicle appears elongated and infiltrated. Sometimes this enlargement extends down the ejaculatory duct and causes the enlargement of part of the prostate on that side as well (Fig. 913). If the

Fig. 913.—A Case of Unilateral Perivesiculitis.

inflammation is severe in both vesicles, it sometimes does not limit itself to the vesicles, but attacks also the cellular tissue around and between them. Such a perivesicular inflammation undergoes resolution or else may break down and discharge into the rectum. It is probable, however, that such a condition is more often due to a periprostatitis extending up along the vesicles.

*Prostatitis* often occurs with vesiculitis, usually preceding it.

*Peritonitis* is mentioned as a complication of vesiculitis, and is so rare that I doubt if it ever occurs as a true complicaton.

Examination and Diagnosis.—This can be made only by rectal examination. The position of the patient for an examination of the vesicles is either the lithotomy position or the erect posture, with the body bending forward at an angle of 45° with the table on which his hands are resting. In the standing position, which is the better, the feet should be separated and toes turned in. (See pages 314–316, Vol. I.) The examiner's right forefinger, incased in a rubber cot and well lubricated, is passed into the rectum on either side over the base of the prostate and the vesicles are felt for (Fig. 914). Normally they are soft and cannot be distinguished, but when inflamed, they are more easily felt, extending obliquely upward and outward from either lobe of the prostate.

In order to reach well up toward the base of the vesicle, it is often necessary to push well into the perineum. In mild cases, they are felt to be distended and tender, resembling a leech tucked in between the anterior rectal and bladder wall. The shape of the vesicle is still maintained, and, even when much distended, there is but slight induration. In the very acute cases, however, the induration is more marked and the vesicle is hot, tender and edematous and extends up from the corresponding lobe of the prostate as if a part of it. The pressure of the finger upon it frequently causes a nauseating, sickening pain, faintness and a cold sweat.

In case of the perivesiculitis above referred to, the space between and around the vesicles is filled with an edematous or plastic infiltration that resembles a large flat tumor in which neither the prostate nor the vesicles can be outlined. But as the exudate is absorbed, the outline of the vesicles and prostate again come into evidence and can be plainly discerned.

Massage of the vesicles per rectum is also of diagnostic value, as by this means the inflammatory products contained in the vesicles can be expressed and passed in the urine in cases in which the lumen of the ducts is not occluded. The contents thus expressed consist of globulin, pus, epithelium, dead spermatozoa and detritus. These sink rapidly to the bottom of the glass.

Fig. 914.—The Finger Palpating the Vesicle by Rectum.

Differential Diagnosis.—*Differentiation from Posterior Urethritis.*—In posterior urethritis, frequency of urination, pain and tenesmus are more marked, whereas in seminal vesiculitis, erections, emissions, pyospermia and

hematospermia are more marked. If the patient passes urine, the first urine in posterior urethritis contains pus and shreds, whereas it is clear when vesiculitis alone is present. If vesiculitis is present and the first urine is clear, the vesicles are felt to be enlarged and tender, and if, after massage, the patient urinates, the next urine contains massaged products from the vesicles.

*Differentiation from Cystitis.*—The differential diagnosis between acute seminal vesiculitis and cystitis is practically the same as that just mentioned symptomatically; for the symptoms of acute cystitis are about the same as those of acute posterior urethritis. There is, however, a difference in the appearance of the urines. If the urine is passed in two glasses, both are turbid in cystitis and contain pus and bladder epithelia, whereas if only vesiculitis exists, the first urine is clear, the vesicles are found to be enlarged and tender, and, if massaged, the patient's next urine contains the massaged products from the vesicles.

**Chronic Vesiculitis.**—Symptoms.—The *general symptoms* are of a neurasthenic character and, unless there is some evidence of a urethritis present, a practitioner might not examine the patient by rectum, and might attribute any vague genito-urinary symptoms to a part of the general neurasthenic condition rather than attribute his general neurasthenic condition to a vesiculitis. Besides this, many cannot feel the vesicles or interpret the condition if they do feel them. I have had men working in my clinic and treating cases of vesicular and prostatic trouble for months, who have had no idea what they were feeling. At one time, I had an assistant who had had a genito-urinary service in the hospital as interne and who had been working in my clinic and office for some months. He used to treat the patients and massage the prostates and vesicles. One day to my amazement I found that he had not recognized the presence of a vesicle the size of the thumb and had never even touched it, and yet he had been attending to this part of the treatment for me occasionally for several weeks.

*Disturbances of micturition* are also quite frequent in chronic vesiculitis, although not as marked as in the acute variety; a burning sensation may accompany the act along the whole canal, or it may be confined to one spot, either the prostatic urethra or near the end of the glans penis. Frequency of urination is, however, not usually marked, unless accompanied by a posterior urethritis or an exacerbation of the disease due to exposure or dissipation. The urine is clear, unless a urethritis is present or there is a suppurative disease of the bladder or kidney.

*Spermatorrhea* is a gleety discharge that may be present, white in color and sticky in character. It is a seminal leakage, due to a thickening and an atonic condition of the walls of the ejaculatory ducts, consisting of masses of globulin, spermatozoa, pus, spermatic crystals, epithelia and sometimes a few blood cells. In spermatorrhea occurring independent of vesiculitis, no pus or blood is

present and the trouble is simply a leakage due to lack of tone in the genital system.

*Pain* of a dull character may be present deep in the perineum, or there may simply be a feeling of uneasiness, discomfort or tickling. There may also be a dull pain in the groin.

*Sexual Erethism.*—The patient complains of frequent erections, priapism. These are due to congestion of the vesicles or the pressure of their contents. The erections may be so constant as to interfere with sleep. The sexual desire is therefore stimulated and, if indulged in, the ejaculation may be painful and the semen may be sometimes, though rarely, bloody or of a rusty color. Nocturnal emissions, accompanied by lascivious and pleasurable dreams, are also present at first, while later they may occur without dreams or even consciousness of these occurrences.

*Impotence.*—As the disease progresses, the erections become faulty or less frequent, the ejaculations take place quickly and the lack of tone increases until erections no longer take place, and the patient suffers from complete or partial impotence. When he does indulge in coitus, it is not pleasurable and often unsatisfactory, and may be followed by headache and a tired feeling, until finally the patient develops a loss of sexual desire. Sometimes there is no emission on account of the ejaculatory ducts being occluded, in which case there may be only a slight dull pain in the deep perineum, besides a sense of discomfort and nervous shock.

The impotence is not psychical, but of the atonic variety, the result of constant irritation of the vesicles. I have discovered that most cases of impotence in men under forty-five years of age coming for treatment are due to a chronic seminal vesiculitis, and treatment directed to the cure of the condition has brought back renewed vigor, so that men who had not been able to cohabit for months have regained sufficient strength to enable them to marry.

On one occasion, in order to illustrate the different symptoms in chronic vesiculitis, I had two patients in the lecture room. One, a married man, suffered from erections to such a degree that he could not sleep, and yet he refrained from intercourse on account of the intense pain accompanying the orgasm. The other patient was engaged to be married and yet could not have an erection on account of the atonic condition of his vesicles. The men were about the same age. The hyperesthetic case recovered but has since had occasional exacerbations. The atonic man married and has several children. They were both treated practically the same way. The feeling of the vesicles in the two cases was very different. In the first case they were very firm and very tender, whereas in the second case, they were large, soft and flabby.

*Neurasthenia.*—The general neurasthenic symptoms are occipital headache; loss of sleep, made worse at times by sexual excitement; a feeling of numbness, or of heat and cold in the limbs or back, or anesthesia or hyperesthesia of vari-

ous portions of the surface of the body; a sensation of numbness or a shrunken condition of the genitals; flushing of the face and embarrassment; indigestion and constipation; a mental lassitude with a tendency to melancholy brooding; a lack of desire to work, difficulty in concentrating thoughts and fears of impotency. Insomnia is at times a very annoying symptom. Some years ago, when the knowledge of vesiculitis was less, if patients, suffering from chronic urethritis, appeared unduly concerned about themselves with nothing apparent to account for their nervousness and worry, they were probably suffering from a complicating vesiculitis, although they were considered hypochondriacs, imaginative and apprehensive.

FIG. 915.—THICK, MODERATELY HARD, CHRONICALLY INFLAMED VESICLES WITH AN IRREGULAR SURFACE.

It must be understood, however, that these cases of chronic vesiculitis vary in their symptoms through an extreme range, and that no two cases agree. Furthermore, that, in the presence of such marked neurasthenic symptoms, even though the local signs are obscure and seemingly unimportant, we should consider the possibility of chronic inflammation of the vesicles and examine them. It must not be thought that all cases of sexual neurasthenia are dependent upon seminal vesiculitis, for these symptoms may attend any lesion along the genital tract, and chronic prostatitis, posterior urethritis, stricture and varicocele are also causes.

EXAMINATION AND DIAGNOSIS.—Chronic vesiculitis resembles closely a mild subacute vesiculitis, and the methods of examination and arriving at a diagnosis are the same as in the acute variety. It must be remembered that there

are two principal types of chronic vesiculitis, the hypertrophic and the atrophic. In the hypertrophic type, the walls always feel thickened, but the marked induration with irregularites in shape, such as follow a destructive process in their walls, does not often exist. When the thick-walled vesicles are uniformly dilated, they often resemble leeches in form, as in the subacute dilated types; but they do not feel the same, as the walls in the chronic cases are less indurated, although thick and atonic. The vesicles, even if their ducts are patent, are often not capable of emptying themselves during coitus, there being always some residue remaining. The atonic vesicles sometimes have the feel of putty or dough and pit on pressure. In chronic vesiculitis, the vesicles at other times have a hard feel and it is difficult to say whether the hardness depends on the contents, or on an induration of the walls themselves. A patient may have had such a plugged condition for several months or perhaps years, and it may require a number of weeks or months of appropriate treatment before the contents are dislodged, after which the vesicles will probably again regain their functional activity, with further treatment directed to improving their tone.

Fig. 916.—Irregular Outline of the Seminal Vesicles, Showing Dilatations and Contractions.

Occasionally the vesicles are felt to be enlarged and yet very irregular, due to some portions of the vesicles being hypertrophied and others atrophied. The same feeling may be due to retained excreta in some portion while the remainder is free (Fig. 916). When secretion is retained in certain alveoli or compartments shut off from the remainder of the vesicles by adhesions or cica-

tricial bands and has become inspissated, a small nodule may be felt, and, if it remains for some years, it may become a concretion or calculus. (See Concretions of the Seminal Vesicles.) In other cases, the entire vesicle may be so atrophied that it can scarcely be outlined or it may have only a stringy feel. The appearance of the urine will be taken up under Differential Diagnosis.

Differential Diagnosis.—Chronic vesiculitis is often mistaken for *chronic urethritis* on account of the urethral discharge. This is often seen at the meatus in the morning drop, closely resembling the goutte militaire of gleet. The discharge in vesiculitis is, however, usually clear, contains whole spermatozoa or pieces of them, spermin crystals and but little if any pus, whereas in urethritis more pus is usually found and no spermatic elements. The urine of chronic urethritis contains shreds, whereas the urine of chronic vesiculitis may be perfectly clear until after massage, when detritus, resembling pieces of membrane, snowflakes, sugar granules and masses of white globulin, may be seen. Rectal examination in vesiculitis shows the vesicles to be pathological, whereas in chronic urethritis the examination by bougie à boule may show narrowings, and the endoscope may show granular patches, erosions and ulcerations.

*Chronic prostatitis* and chronic vesiculitis resemble one another very closely symptomatically, on account of their close proximity and deep situation. With both of these, there may be a gleety discharge. The former shows Boettcher's crystals and amyloid corpuscles, whereas the latter shows spermatozoa and spermin crystals. The prostatic discharge, if present, is much more liable to appear in the urine after defecation in prostatitis than in vesiculitis. Rectal examination also shows the difference. In prostatitis, the prostate may be enlarged, soft and flabby, or it may contain irregularities and depressions corresponding to the cavities in the gland due to a destructive suppurative process, or to cicatricial bands. Enlargement or irregularities of the vesicles are also apparent, if present. It must be remembered that both of these troubles may be associated and occur at the same time. Chronic vesiculitis may also be secondary to chronic prostatitis. The urine after massage in prostatitis is turbid and contains, mixed with the urine, plugs of pus and inflammatory products; whereas in seminal vesiculitis, detritus composed of globulin and inflammatory material resembling pieces of membrane, snowflakes and sugar granules are passed. (See Examination of Patient, page 317, Vol. I.)

*Stricture* is often mistaken for chronic vesiculitis and many cases have been operated upon by practitioners, inexperienced in this line of work, in an effort to establish a cure. Many neurasthenics, in the days when all chronic troubles of the genito-urinary tract were supposed to be due to stricture, applied for the relief of vague symptoms and were sent to me for operation, who simply needed treatment for seminal vesiculitis and were cured by this means. Patients who had been operated on for stricture and cut up to such a size that

my largest sounds would enter with ease, and had obtained no relief, were also found to be suffering from vesiculitis and cured.

I have treated a large number of physicians and general practitioners with genito-urinary troubles, and it has frequently happened that they have consulted me for the treatment of a stricture and yet the examination showed that they were suffering from a vesiculitis alone or associated with a posterior urethritis. I have in mind while writing, one of my assistants in the clinic, well posted in genito-urinary surgery, who called upon me with the following history: He said that he had had several attacks of urethritis and had been troubled with a stricture for some time, which he thought was closing up on him, as he had a feeling of pressure over his bladder in front and a sensation that he could not fully empty his bladder. He was suffering from pain in the perineum and some frequency of urination. He was desirous of having his stricture cured, as he was about to be married. I examined him and found a narrowing just admitting a No. 25 French in the deep urethra. I accordingly began to dilate his urethra by means of sounds, but, on each visit, found that I had more difficulty in passing them than on the previous one, and on the third occasion could scarcely pass a No. 19 French, whereas at the beginning I had introduced a No. 25 French. This led me to think that he had a vesiculitis and I advised him to allow me to examine him in a routine way and make a diagnosis. I accordingly made a rectal examination and found that he had an exacerbation of a chronic vesiculitis, due to excessive genital excitement, with ungratified sexual desire. I then discontinued the dilatations and began to treat the vesicles by hot rectal douches of salt solution and hot sitz baths, cautioning him against sexual excitement. At the end of the week, I began to treat the vesicles locally by massage and emptied them of a very large amount of accumulated inflammatory material, which greatly relieved him. No gonococci could be found on several examinations and but few pus cells. After treating the vesiculitis for a short time, I easily passed a No. 27 French sound through his urethra and his stricture and other symptoms had entirely disappeared.

The nervous troubles from which patients with vesiculitis suffer are generally of a neurasthenic type; but if it is found on rectal examination that seminal vesiculitis is not present, other genital causes must be looked for, such as chronic prostatitis, posterior urethritis, epididymitis, varicocele and funiculitis.

*Varicocele* is at times mistaken for vesiculitis on account of an uncomfortable feeling in the groin and testis on that side, and the veins, even though not much enlarged, are removed for this reason. I have lately seen two cases in which a varicocele operation had been performed without relieving the symptoms, one of which was treated by me afterwards for vesiculitis and relieved.

*Hernia* is also mistaken for chronic vesiculitis, and several patients suffer-

ing from vesiculitis have come to me who have been advised to have a herniotomy performed for a pain in the groin diagnosticated as a beginning inguinal hernia. On examining such cases and finding vesiculitis but no hernia present, I have treated the vesiculitis until cured, after which there were no more symptoms that could be mistaken for hernia.

Chronic vesiculitis is at times mistaken for *pyelitis*, on account of the marked nervous polyuria which sometimes occurs during an exacerbation of the trouble. The pains, however, are situated in a different locality: In pyelitis, they are situated principally in the loin and sometimes reflected downward, whereas in vesiculitis they are principally in the perineum and groins and are occasionally reflected upward. A rectal and urinary examination will complete the differentiation.

**Treatment of Vesiculitis.**—The treatment of acute vesiculitis is very similar to that of prostatitis. Prophylaxis consists of proper treatment of the preceding condition, whether it is posterior urethritis, cystitis, stricture or other cause of vesiculitis. When the acute symptoms are marked, all urethral treatment should be discontinued.

The diet should be light, if there is any fever, otherwise the same as in urethritis. (See Urethritis Diet.) The bowels should be moved daily with saline aperients, such as citrate of magnesia, Rochelle salts, Apenta or Carabaña water.

Pain, especially when accompanied by spasm and tenesmus, can be controlled by anodyne mixtures as:

℞ Morphin. sulph. (gr. ¼) or Codein sulph. (gr. ½)
Tinct. belladon. ..... ♏ vijss
Potass. acetat. ..... grs. xv
Aq. gaultheriæ .....ad ℥j

M. S.: One such dose three times a day in a glass of water between meals.

℞ Morphin. sulph. (gr. ¼) or Codein sulph. (gr. ½)
Tinct. hyoscyami ..... ♏ xv
Potass. acetat. ..... grs. xv
Aq. gaultheriæ .....ad ℥j

M. S.: One such dose three times a day in a glass of water between meals.

When the patient is nervous and wakeful in addition to the antispasmodics chloral hydrate or bromid of potash can be given.

| | | Grams. |
|---|---|---|
| ℞ Codein sulph. | grs. ½ | .032 |
| Chloral hydrate | grs. vijss | .5 |
| Pot. bromid | gr. xv | 1 |
| Aq. menth. pip. | q. s. ad ℥j | 4 |

M. S.: One such dose on retiring or every six hours in a glass of water.

When a *posterior urethritis* coexists, it should be treated by instillation of nitrate of silver from 1 : 500 to 1 : 50, or a posterior urethral wash.

In the treatment of vesiculitis, hot sitz baths of ten minutes' duration at a temperature of from 102° to 110° F., night and morning, are advisable.

There can be no direct local treatment of vesiculitis, as nothing can be introduced into the vesicle through the ejaculatory duct for this purpose. We must employ indirect means of treatment through the rectum and the prostatic urethra. Rectal irrigations with hot salt solutions, and massage of the vesicles are recommended. The rectal irrigations of hot salt solution at a strength of ℥ss to the gallon, at a temperature of from 110° to 130° F., are given by means of the recto-genital tube. This is a double-barreled tube with its end curved slightly upward. (See Rectal Irrigation, pp. 341 and 342, Vol. I.) After the acute symptoms have somewhat abated, through hot rectal irrigations and other local remedies, massage of the vesicles through the rectum should be commenced.

*Massage of the vesicles* consists of gentle manipulation with the palmar surface of the index finger, for the purpose of reducing the inflammation and at the same time expressing their contents when retained. Stripping the vesicles in chronic cases requires more force, and for this reason does not, to my mind, have the same therapeutic effect. If one is familiar with massage, it is easy to form an idea how it is applied to the vesicles, but it is difficult to explain it in words. The movement of the finger can be shown, but it requires experience to understand how the pressure should be graduated in order to benefit and not to irritate the internal genitals. The forefinger, well lubricated, is introduced per rectum and carried up over the prostate until the apex of the vesicles is reached, about two and one quarter inches from the anus. From there it gently glides along the organ to its base, when a downward movement toward the prostate is again begun, the finger turning from side to side and exerting gentle pressure until it again reaches the apex. This is repeated for five to ten minutes over one vesicle, and then the other is treated similarly, if abnormal. During this massage, the patient should stand bending over a chair or table at an angle of 45° or a little less. If the soft parts in front of the rectum are too yielding, by placing the finger tips of the other hand above the pubic spine in the groin and about parallel with the inguinal canal, counterpressure may be made by which the parts are steadied enough to assist in the manipulation. (See Fig. 240, Vol. I.)

Massage of the vesicles should be repeated every two to four days. Sometimes nothing is expressed from the vesicles by massage at first; but later, as the treatment proceeds, at each visit it is noticed that the detritus is more easily expressed and the tenderness of the vesicle lessened. The organ becomes softer, resumes its function and diminishes in size until it can no longer be felt.

The relief obtained from massage is often wonderful and the amount of detritus expelled after a treatment seems incredible.

On one occasion, a patient called to see me complaining of an uncomfortable feeling in his perineum. His vesicles felt very large and prominent by rectum. After massage, he was instructed to pass urine. He passed at first a small quantity and then stopped; this was followed by a splash and another stoppage of the stream, again followed by a splash and a continuation of his stream. On examining the urine, there were found two masses present one and one quarter inches in length and nearly half an inch in diameter. They resembled closely the size and shape of the vesicles that I had just examined. Whether one of these masses had come down from a vesicle each time there had been a splash or whether the contents of the vesicles had been expressed into the posterior urethra by massage and then had become molded in the posterior urethra and passed out in the stream, it is difficult to say. It seems impossible that such a mass could be passed through the ejaculatory ducts and yet the circumstances connected with the maneuver would indicate it. Other patients have passed what I have taken to be the cast of one vesicle. (See Plate II, Fig. 4, in Vol. I.)

Another patient, a physician, came to me complaining of an uncomfortable feeling in the perineum and suprapubic region, slight frequency of urination and nervousness. Examination showed the presence of well-marked vesiculitis and a large amount of detritus was passed in the urine after massage. On his next visit he said, "My urinary symptoms have nearly disappeared, but the most remarkable part of the last treatment was that it has cured me of insomnia, from which I have been suffering for several weeks."

Atonic impotence is the condition that is most benefited by massage of the vesicles, and patients who have not had erections for weeks and months have felt themselves to be satisfactorily cured, after having been treated by this means together with rectal douches and dilatations of the posterior urethra, and have married and continued in good condition since then owing to a well-regulated sexual hygiene.

*Suppurative cases*, that is, with pus present in the vesicles, are quite common, but abscesses are very rare. When an abscess is present and threatens to burst, it can be opened by a rectal incision through a valve speculum, or by passing a guarded bistoury into the rectum along the index finger and cutting the abscess by the sense of touch, or by dissecting down between the rectum and bladder through the perineum and thus incising it. I have never yet had

in my private practice, hospital work or clinic, a case of abscess of the seminal vesicle that I thought needed an operation, and I have examined many thousand vesicles.

## TUBERCULOSIS OF THE SEMINAL VESICLES

**Etiology.**—Primary tuberculosis of the seminal vesicles is very rare. Tuberculosis is usually secondary to either tuberculosis of the prostate or epididymis. When it is secondary to tuberculosis of the prostate, the tuberculous prostatitis is generally itself not primary, but is in turn secondary to either tuberculosis of the kidney or epididymis. The disease is more frequent in adults, over fifty per cent of whom are between the ages of twenty and forty years.

As to the affection of other organs in cases of tuberculous vesiculitis, Guelliot gives the following data, collected from 59 cases of the disease:

The lungs were affected in 40 cases.
The prostate was affected in 36 cases.
The testes and epididymis in 31 cases.
The bladder and urethra in 29 cases.

In my own practice the existence of tuberculosis in the organs mentioned has been much less frequent, although I have never gone over my histories and made statistics.

Guyon believes that a chronic tuberculous inflammation is apt to follow a chronic vesiculitis of gonorrheal origin.

Both vesicles may be attacked simultaneously, but they are not always affected to the same extent.

**Pathology.**—The tuberculous process usually begins at the lower or narrower portion of the vesicle. The lesions are essentially infiltration and caseation. The mucous and submucous coats of the organ are at first the seat of a small round-cell infiltration. Later the tuberculous areas undergo caseation, especially those nearest its lumen. Thus a cheesy tuberculous mass is formed inside the vesicle. The mucosa is gradually destroyed, and only the fibrous and muscular coats remain. The lumen is reduced to a mere slit, on account of the thickening of the walls and partitions; which are the seat of new connective-tissue formation. There may also be smaller or larger cavities in the walls themselves. The contents of these cavities consist of fluid and caseous material which is the result of the tuberculous necrotic process. The termination of the tuberculous process in the vesicles may be through sclerosis and atrophy; or through calcification and sclerosis of the fibrous and muscular layers; or the tuberculous process may be self-limited in some cases, although it may be only a quiescent state.

Guelliot states that impotence usually results from tuberculosis of the vesi-

cles, while sterility is the sequel of similar affections in the testes. He found spermatozoa in the affected vesicles in the cases in which the testes were not affected.

The perivesicular cellular tissues may also be involved. There is first edema, then thickening, owing to the growth of new connective tissue.

**Symptoms and Diagnosis.**—The onset of the disease is usually insidious, although it may be preceded by evidences of tuberculosis in other parts of the genito-urinary system, as the kidney, bladder, prostate and epididymis, in which the symptoms may be marked. In some cases, the disease begins with acute symptoms and some authors designate this group of cases as acute tuberculous vesiculitis. These cases often cannot be distinguished from the gonorrheal variety, except by the presence of the bacillus of tuberculosis. There may be more or less severe urinary disturbances, depending upon the presence of the inflammatory process in the bladder, prostate and urethra. There is frequently bloody semen, and pain during or after ejaculation. There is always more or less sexual erethism, that is, increased excitability. There is frequency of urination, with at times shreds, pus and blood in the urine. Sterility and impotence may follow tuberculous vesiculitis. There is also pain in the groin. As I mentioned under Vesiculitis, the disturbance in the groin has frequently led surgeons to advise a herniotomy for the cure of a beginning hernia. I will here recite the history of a case showing the relation of tuberculous vesiculitis to hernia.

A machinist, aged nineteen, was brought in consultation for decision about the advisability of operating upon a hernia which he had had all his life, but for which at present he could not wear a truss, as the discomfort was quite marked, due to a sense of weight and pain on the left side of the abdomen, especially on walking about. He thought that it had been aggravated by his lifting a heavy weight some time before. He was constipated, had some ardor urinæ and frequency of urination and was passing urine five or six times daily. On examining this patient, a hernia was shown on the left side, bound down by adhesions. Rectal examination showed the prostate and seminal vesicle on that side to be large and indurated, fused into one mass the size of a pullet's egg, so that it was difficult to reach over the top of the tumor. This evidently gave rise to all the symptoms which were referred to the hernia. The condition was characteristic of tuberculosis and subsided under treatment by hot rectal douches, creosote, iron and hypophosphites.

Examination.—Rectal examination is necessary for a satisfactory knowledge of the existing conditions in the vesicle. Pressure on the vesicles is accompanied by little or no pain at the first examination, but if the rectal palpation is frequently repeated, the vesicles become tender and painful on pressure. This point is placed by Fuller in contrast with the conditions existing in ordinary chronic vesiculitis, namely, that the vesicle in chronic vesiculitis is tender

at first and less sensitive later. The vesicles are felt to be enlarged and at first slightly hardened and smooth, then nodular, and finally soft and filled with a mass of the consistence of tallow. The perivesicular tissues are sometimes infiltrated, but this is not characteristic, as it occurs in other forms of vesiculitis. Vesicular tuberculosis is frequently associated with that of the prostate as is

FIG. 917.—A TUBERCULOUS VESICULITIS AND PROSTATITIS. Note that in both lobes of the prostate there is a depression due to destruction of tissue and that the seminal vesicle is round, smooth, and about twice the size of the prostate.

shown in Fig. 917, and sometimes reaches a large size with a smooth hard surface. (See also Figs. 597 and 599.)

A tuberculous abscess may discharge by a fistulous opening into the rectum, the perineum or the bladder. There may be spontaneous recovery after such a discharge. There are but few other symptoms which point to the tuberculous nature of the trouble. It is well to inquire into the general condition of the patient and to examine for possible tuberculous lesions elsewhere. A coexistent epididymitis is quite frequent and points to the origin and nature of the vesicular inflammation. Some tuberculous patients give a history of gonorrhea and attribute the beginning of the trouble to the urethritis. Their supposition is in many cases correct, for gonorrhea acts as a predisposing cause of local tuberculosis. The seminal discharge or the expressed contents of the vesicles should always be examined for tubercle bacilli in cases of suspected tuberculosis, as it is the most certain method of arriving at a positive diagnosis.

**Treatment.**—The treatment of tuberculous vesiculitis may be divided into the general or medical and the surgical.

The *medical treatment* consists in the observance of the proper hygienic and dietetic measures, in the removal of the patient to a proper climate and in the administration of cod-liver oil, hypophosphites, creosote, guaiacol or derivatives of this last group of remedies and syrup of the iodid of iron. The care of the bowels is most important, as masses of feces in the bowel aggravate the disease. The constipation should be treated with laxatives. Instrumentation of the posterior urethra should be carefully avoided.

The *surgical treatment* consists of the Zuckerkandl, the Von Dittell, the Rudygier and the Villeneuve methods for opening abscesses of the vesicles or their removal. As I do not believe in the removal of the vesicles, I will simply refer the reader to the works that treat of the subject and say that I prefer the method described by Pierre Duval (Figs. 920 and 921).

## OPERATIVE SURGERY OF THE VESICLES

The operative treatment in cases of disease of the vesicles is not frequent as compared with that of the other parts of the genito-urinary tract.

I have had several thousand cases of seminal vesiculitis, including very bad cases of tuberculosis, in which the vesicles were enormously enlarged and associated with secondary infection and yet the process has always come to a sufficiently satisfactory termination without operation.

Other practitioners believe that operative interference is indicated, and my colleague Dr. Fuller has done a large number of vesiculotomies by the perineal route with the object of draining the vesicles. The vesicles have also been removed, both by the perineal and the suprapubic route. In case a diseased vesicle develops an abscess, it would probably break into the lumen of the vesicle and discharge through the ejaculatory duct into the urethra. If, however, it should burst through the outer wall of the vesicle into the recto-vesical space, it would then either break through the covering of peritoneum reflected from the bladder to the rectum and discharge into the peritoneal cavity, giving rise to a peritonitis; or it would dissect beneath the peritoneum covering of the roof of the bladder and empty into Retzius's space; or it would break through the bladder or rectum and discharge into these cavities; or, what is most frequent, it would accumulate in the recto-vesical space and push aside the surrounding tissue until it bulges out the perineum, at which point it can be incised. I have never seen a case of any variety of vesiculitis that I believed emptied into the peritoneal cavity, bladder or directly into the rectum. I have had a case, however, in which a tuberculous vesicle the size of a hen's egg quickly decreased to one of very small size, following the breaking of an abscess into the rectum through the corresponding lobe of the prostate in the region of the ejaculatory duct, and believe that in this case the bursting of the tuberculous abscess into the rectum may have allowed the ac-

cumulation of pus in the vesicle to discharge through or alongside of the ejaculatory duct and the prostatic lobe into the rectum. In another case, in which a large and tender seminal vesicle in acute seminal vesiculitis was followed, after it had become smaller, by an accumulation of pus in the prevesical space led me to believe that the pus had dissected up the peritoneum over the bladder and discharged into the space in front of the bladder.

Most of the cases of abscesses presenting in the perineum are from the perineal portion of the urethra, whereas some come from Cowper's gland, and others come from the prostate; and, although I cannot at the present writing think of a single case in which I have observed a vesicular abscess to have pointed in the perineum, I believe that when they break through the outer wall of the vesicle they are more liable to point there than elsewhere. It is, however, much more difficult in the case of the presence of pus in the recto-vesical space, unless the practitioner has followed the case through from its first development, to detect the origin of pus coming from the vesicle rather than from the prostate, because the vesicle is much smaller after the pus has been evacuated; and, as it lies on the soft wall of the bladder, there is not sufficient resistance offered to allow the same distinct palpation that can be obtained in palpating the prostate which is larger and firmer. In suppurating cases that have broken through the vesicular wall, as in suppuration from other sources, an evacuation of the pus is indicated at the place where the abscess points. In the case of an accumulation of pus in the recto-vesical space, accompanied by marked sepsis that does not point anywhere in particular, the same perineal incision should be made that is employed in the extracapsular perineal prostatectomy.

**Vesiculotomy.**—Vesiculotomy can be performed (1) in cases of chronic vesiculitis with abscess to evacuate the pus; (2) in cases of chronic vesiculitis to establish drainage; (3) in cases of cyst to evacuate the contents.

Perineal Vesiculotomy—Fuller's Operation for Drainage of the Seminal Vesicles.—This operation is performed for draining the seminal vesicles in cases of chronic seminal vesiculitis. Dr. Fuller recommends it in patients suffering from vesiculitis and having groups of symptoms which he classifies under the headings of Urinary, Genital and Generalized. He goes on to say that one of the groups may exist alone, or two or three combined. The urinary symptoms consist of relapsing urethral discharge, shreds, pus, bacteria, frequent, painful and difficult urination. The genital symptoms are sexual excitation, priapisms, frequent and perhaps painful emissions, localized pain in the deep perineum, rectum, suprapubic and inguinal regions, and, in more chronic cases, sexual weakness and partial and perhaps complete impotence. The general symptoms are those of neurasthenic or nervous reflex, mental and rheumatic. They are depression, confusion, apprehension, melan-

choly, and rheumatism, so-called gonorrheal, due to absorption from a focus of vesicular infection. Fuller also mentions rheumatic cases associated with seminal vesiculitis, that have been cured by vesiculotomy, who have never had gonococcal urethritis and whose vesical inflammations have been due to other infections.

*Technique of the Fuller Operation.*—The patient is placed in a position resembling the "knee-chest." The external incision consists of two converging longitudinal cuts beginning on either side a little above the upper border of the patient's coccyx and just inside the body of his right ischium, and extends downward and slightly inward, keeping just within the border of that bone, passing the tuber ischii and ending somewhat below the tuberosity at a point laterally and about three fourths of an inch in front of the anterior margin of the anus. A transverse cut connects the converging ends dividing the perineum transversely three fourths of an inch anterior to the margin of the anus. The transverse incision is then deepened, the forefinger of the left hand is introduced into the rectum acting as a guide, while deep dissection is made with the scalpel in the other hand, through the levator ani muscle and the visceral layer of the pelvic fascia (Fig. 918). The right forefinger is then inserted through the cut into the lymph space between the prostate and the rectal wall and the tissues are separated until the seminal vesicles and the posterior part of the base of the bladder wall have been exposed. The tip of the right forefinger is then held against the seminal vesicle while a grooved director, held in the left hand, is passed along the finger until its end touches the apex of one of the vesicles. The grooved director is then held in place by the left hand, while the point of a scalpel in the right hand is passed along its groove and opens the wall of the vesicle at its apex (Fig. 919). From this point an incision of one and one quarter to one and one half inches in length

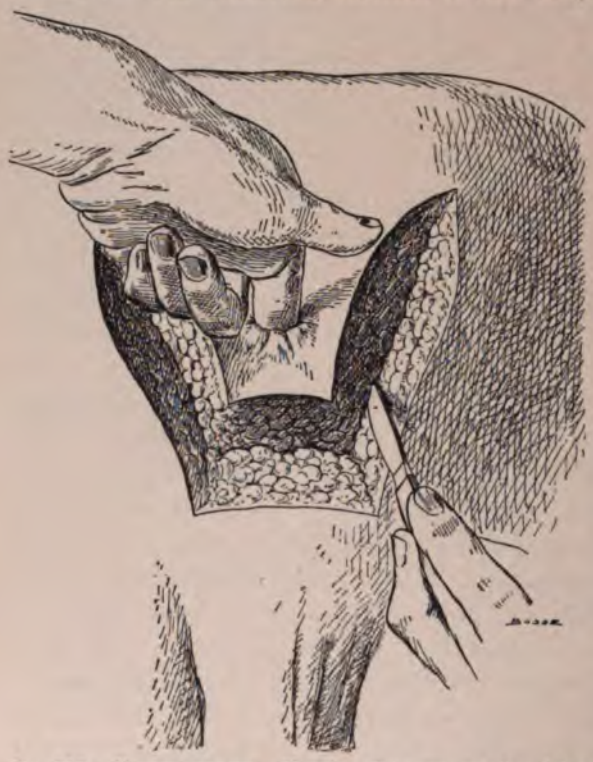


FIG. 918.—VESICULOTOMY. Showing the manner of making the incision. (Fuller's operation.)

is made down to its base. After this, the finger tip is inserted into the cavity of the vesicle and dilates it. If granulations are felt to be present, they can be removed by curetting. The seminal vesicle is then packed with gauze, the distal ends protruding from the wound, and two rubber drainage tubes are placed between the gauze and the rectal wall. The lateral incisions are now united, drainage is kept up from nine to ten days and in rheumatic cases for two weeks, as in these cases a longer period is necessary to prevent recrudescence.

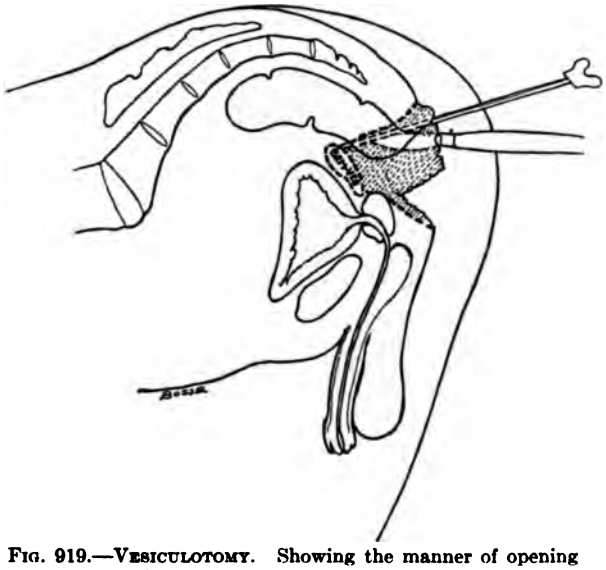


Fig. 919.—Vesiculotomy. Showing the manner of opening the vesicle. (Fuller's operation.)

Perineal Vesiculotomy as Described by Pierre Duval.[1]—The patient is placed in the lithotomy position with the thighs well flexed and separated and a pillow or some other object under the sacrum to elevate the buttocks. The incision is made in front of the anus, either transverse, semilunar or shaped like an inverted Y. The rectal and genital planes are then separated by a transverse incision just behind the perineal center and the rectum is separated from the prostate as in the operations of Young, Zuckerkandl and the French prostatectomists. The incision is held widely open by two retractors, one inserted above and behind the bulb and the other in front of the rectum. The tissues are then further separated until the vesicles come into view, when an incision can be made through the fascia and the wall of the vesicle beneath it as in Fig. 920. A metallic sound passed through the urethra with the beak turned in the bladder so as to catch behind the base of the prostate acts as a guide in locating the vesicles.

If the surgeon wishes to be more careful, he should cut through the fascia over the vesicle from the base of the prostate, as just described, and then dissect back the two sides of the fascia and thus expose the vesicle and the ampulla of the vas, as in Fig. 921. A more exact longitudinal incision is then made in the vesicle than when it is covered by fascia. The opening of the vesicle, after incision and retraction of the fascia, is considered the wiser procedure, as in this way the blood vessels lying over the vesicles can be better

[1] "Précis de technique operatoire."

seen and any hemorrhage more easily controlled. Concretions can also be more thoroughly removed from the vesicles when present.

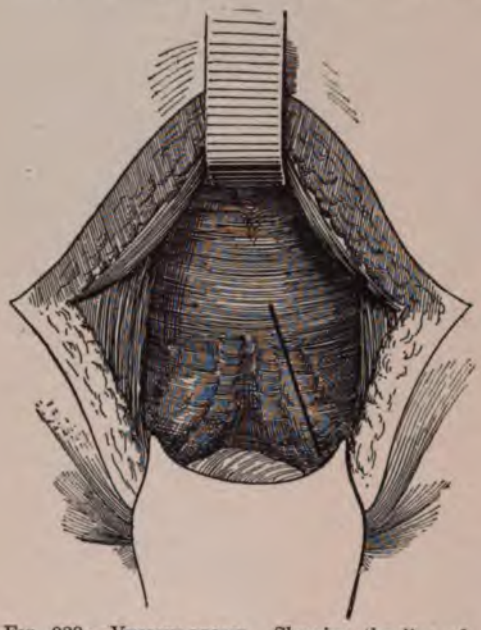


FIG. 920.—VESICULOTOMY. Showing the line of incision over the vesicle. (From Pierre Duval.)

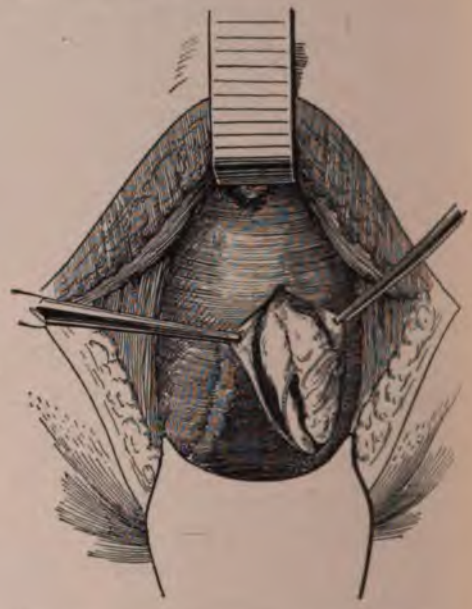


FIG. 921.—VESICULOTOMY. Showing the fascia opened and the vesicle and vas exposed. (From Pierre Duval.)

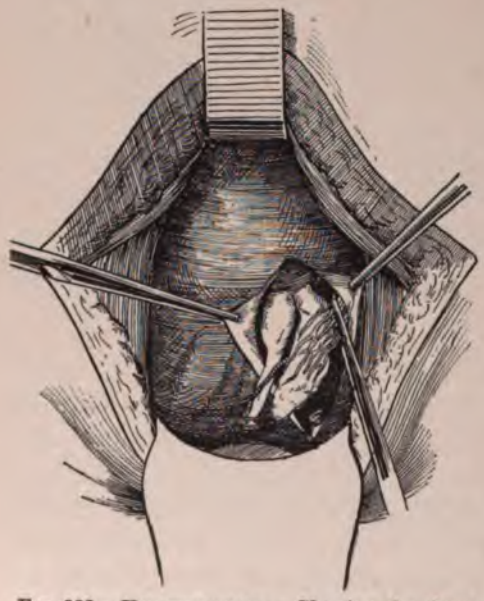


FIG. 922.—VESICULECTOMY. Showing the clamp on the neck of the vessels of the vesicle prior to removing it. (From Pierre Duval.)

**Vesiculectomy.**—This operation can be performed for malignancy, tuberculosis or chronic suppurative vesiculitis. At the present writing, I have seen but one case in which I even considered this operation, and this was a case of tuberculous vesiculitis accompanied by great suffering.

TECHNIQUE.—The approach to the vesicles in vesiculectomy is the same as just described under Vesiculotomy and illustrated in Figs. 920 and 921. The further steps are to catch the vesicle at its apex with a pair of forceps, to lift it from its seat beside the ampulla of the vas, then to clamp, to ligate and divide the vessels on the sides of the vesicle as in Fig. 922, and then, having de-

tached it from the vas and the surrounding tissues, to ligate and cut through its neck. The same technique applies to the removal of the ampulla of the vas in case it is removed at the same time; it is also advisable to cauterize the stumps.

Drainage is not indicated in cases of vesiculectomy unless the wound is infected.

Of the other methods of removing the seminal vesicles, the operations by the inguinal and suprapubic routes should be described. The sacral and the parasacral are no longer employed.

Inguinal Operation.—The patient is placed in the Trendelenburg position. An incision is made on the inner side of Poupart's ligament, from the spine of the pubes to the anterior-superior spine of the ileum, as in the operation for removing calculi from the lowest portion of the ureter. It extends through the skin and the fascia of the external oblique muscle, the internal oblique, the transversalis and the transversalis fascia. The epigastric artery is ligated and cut and the muscles of the abdominal wall on that side, together with the peritoneum, are drawn toward the median line (Fig. 409, Vol. I). The spermatic artery and vein can now be seen to separate from the vas deferens, the two former extending up to the aorta and the vena cava and the latter down into the pelvis to the base of the bladder. The operator grasps the vas and follows it downward, making gentle traction until a point is seen at which the tissues protrude, which indicates the site of the seminal vesicles. The loge of the vesicles can be more accurately ascertained by first locating the base of the prostate and making an incision through the fascia above it. The sides of the incision are retracted on either side disclosing the vesicle, the ampulla of the vas and the blood vessels supplying the vesicles. The vessels are ligated and the vesicle, or the vesicle and ampulla of the vas, removed in the same way, as has just been spoken of in Perineal Vesiculectomy. See Figs. 920, 921 and 922, which show the vesicles and the ampulla of the vas in the same relation to each other, but from below up instead of from above downward. A large drain is placed down to the loge of the vesicle which extends up between the peritoneum and the abdominal wall, leaving the incision just above the pubes. The wound is then closed in three layers: First, the transversalis fascia and muscle together with the internal obliquus; second, the external obliquus; third, the skin. The testes and the remainder of the cord can be removed at the same time, if necessary, making the operation known as the total extirpation of the genital tract.

In the operation for the removal of a ureteral calculus from the lower part of the ureter by the inguinal incision, the same picture is presented as we have just described under Vesiculectomy.

Inguinal vesiculectomy is not recommended, as it is an extensive operation and leaves a weakened abdominal wall.

Suprapubic vesiculectomy is the only remaining operative procedure to describe. I do not consider it as satisfactory as the perineal operation. The technique of the operation is to make a suprapubic incision into the prevesical space and then to push the peritoneum back over the bladder until we have reached its fundus on which the vesicles are found. The vesicles are then removed by the method spoken of under the Perineal Operation. The procedure is difficult, especially if any pericystic adhesions are present and there is always danger of tearing the peritoneum, although this gives rise to no great danger if it is repaired before the vesicle is removed.

# CHAPTER LXXI

## LUES (SYPHILIS)

### DEFINITION

THE name lues or syphilis is given to a specific contagious constitutional disease of a slow and of a fairly typical course, due to an infection by means of a spirillum known as the Spirocheta pallida. The disease starts through the infection entering an abrasion or tear of the skin or mucous membrane, at which point there develops the initial lesion called chancre. From here it gradually travels through the entire organism, giving rise to various lesions of the surface or the deeper tissues of greater or less severity.

During the disease there are intervals more or less fixed, that are called stages. These are known as the primary, secondary and tertiary, denoting the various periods of the disease and the time required for their development.

### HISTORY

Lues was first recognized and written about toward the end of the fifteenth century, at the time of the famous siege of Naples in which the soldiers of France, Spain and Italy were engaged. The soldiers of the different nations became the victims of the disease and those of one nationality called it by the name of one of the others. The most lasting of these terms was the "morbus Gallicus," or the "French disease"; and even at this day, in the Spanish-speaking countries, it is known by the name of Gallico.

It was thought at that time to be a disease having its origin among the American Indians, and that the Spanish sailors who accompanied Columbus on his later voyages acquired it in North America and spread it among the people of Southern Europe on their return. To substantiate this theory, certain investigations were made among the graves of the mound builders in the southern part of the United States by certain students of the subject, who found the bone lesions resembling those of the tertiary stage in abundance among the skeletons discovered in these mounds.

Obscure references to ulcers and other affections are found in the early writings of the Hebrews, Greeks and Chinese, but they cannot be interpreted as belonging to the disease in question.

Whatever may have been the origin of the disease, having reached Europe it spread rapidly from Italy as the best-known focus over the whole Continent, and there was for a long time great confusion in the minds of physicians as to what lues really was. At one time, all urethral discharges, all venereal ulcers as chancres and chancroids with or without buboes, as well as secondary and tertiary lesions, were considered as forms of the same disease. This confusion lasted until the middle of the last century, when they were eventually classified by Ricord, whose classification still exists.

## GENERAL DESCRIPTION OF THE STAGES

For the better distinction of the course of the disease, we may divide the subject as follows:

The exposure.
The first period of quiescence, or incubation.
First stage, that of the initial lesion or chancre, the local manifestation.
Second period of quiescence.
Second stage, that of constitutional manifestation.
Third period of quiescence.
Third stage, localized manifestations of destructive changes in any tissue of the body.

### Exposure, Incubation and First Stage

The exposure occurs at the time when the part of the body, either genital or extragenital, comes in contact with the infection and inoculation takes place.

The first period of quiescence represents the period between the inoculation and the appearance of the initial lesion, usually about three weeks, during which time the point inoculated by the virus is developing into the initial lesion or chancre, the first local manifestation of the disease. This may develop on any part of the body, but most commonly on the external genitals.

**Method of Infection.**—Lues may be given from one person to another by means of the secretion of the initial lesion, of condylomata, or mucous patches, the initial lesion and the mucous patch being the most frequent sources. In congenital lues, the virus may pass from either parent to the fetus; whereas in case it came from the father, and the mother was not inoculated at the time of coitus, she may acquire the disease from the infant. The infection is, however, usually carried through an abrasion of the mucous membrane or the integument during coitus. The initial lesion is found in about ninety per cent of the cases on the genitals; in about three per cent on the lips and in the remaining seven per cent on other portions of the body, especially the fingers. I have also seen it on the nose and shoulder.

LUES INSONTIUM. This includes a certain group of cases in which the individuals have not exposed themselves to the usual methods of infection, but acquired the disease by using contaminated articles such as pipes, drinking glasses, etc.

**Incubation.**—During the first period of quiescence, the virus is developing into an initial lesion in the place which it entered and there are no symptoms. It is called the period of incubation. This varies according to the patient's histories, from two weeks to two months, but the average period is three weeks.

**The First Stage.**—This is represented by the appearance of the initial lesion or chancre, which is the first sign of the disease. It represents the point at which there has been a loss of epithelial or epidermal covering, through which the poison has entered the system. It is usually single, although it may be multiple, depending on the number of abrasions or ports of entry for the virus. It has a circumscribed redness which soon appears elevated, with a flat top. It then either remains as an erosion or develops into an ulcer, in either of which cases the same gross characteristic features remain. The lesion increases in all directions slowly, forming well-rounded edges, and at the same time becomes harder and firmer. The appearance of the lesion, if it be an erosion, is glossy and red with a thin white film of secretion upon it. If it is an ulcer, it is usually not so acutely inflamed as a chancroid and does not discharge as much pus. Its edges are even and well rounded. If it is taken between the thumb and finger at this stage, the lesion sometimes feels as hard as if a foreign body had been introduced below and within the integument, and has a peculiar feeling of induration different from the healthy tissue about it. When the lesion is on the prepuce, its base is hard and thick; but when it is on the glans, the base is at times so thin that it is spoken of as a wafer chancre. After the lesion has healed, a white hard nodule may remain for some time.

DIFFERENTIAL DIAGNOSIS BETWEEN CHANCRE AND CHANCROID

| CHANCRE (FIG. 923) | CHANCROID (FIG. 924) |
|---|---|
| Period of incubation about three weeks. | Period of incubation a few days. |
| Number of lesions, usually single. | Usually multiple. |
| Appearance that of an erosion or ulcer. | Always an ulcer. |
| Amount of discharge slight. | Discharge moderate or quite abundant. |
| Edges well rounded. | Edges irregular. |
| Base indurated. | Base not indurated to any marked degree. |

DIFFERENTIAL DIAGNOSIS BETWEEN CHANCRE AND CHANCROID (*continued*)

| CHANCRE (FIG. 923) | CHANCROID (FIG. 924) |
| --- | --- |
| Glands in the groin enlarged slightly, from about the size of a small bean, and have the elastic infiltrated feel typical of recent enlargement; they are usually all enlarged somewhat. | Glands in the groin usually enlarged at a certain point and may coalesce and form a mass called a bubo. This may break down and suppurate, forming an ulcer, closely resembling a large chancroid. |
| The Spirocheta pallida is found. | The Bacillus of Ducrey is present, but the spirocheta is absent. |

A mixed sore is one in which the infection of both lues and chancroid have been taken in at the same time. In a few days after exposure, one or more ulcers develop which are typical chancroids. One or all of these apparent chancroids may in three weeks change their appearance and develop a hard base and other symptoms of chancre; or the sore may entirely heal in a week or ten days and later the chancre may develop in the scar of the old wound, assuming the appearance of a typical chancre. Generally in a case of the double infection when a number of chancroids appear shortly after coitus, all but one of them heal and that one develops into an initial lesion.

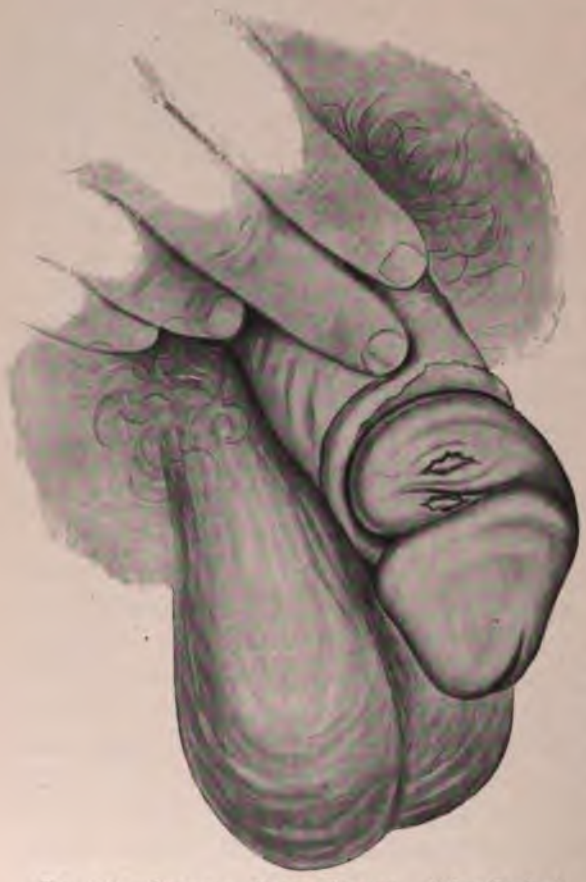


FIG. 923.—CHANCRE, INITIAL LESION. (After Taylor.)

The diagnosis of lues can now be more surely made at an earlier date than ever before through finding the spirocheta or by means of the Wassermann test. The spirocheta can be found in the scrapings of an initial lesion, a mucous patch, condyloma or almost any secondary lesion by the dark-field illumination

or staining test. (See chapter on Discharges.) By the Wassermann test, a positive reaction has been obtained as early as the third week after the appearance of the initial lesion.

FIG. 924.—CHANCROID WITH SMALL CHANCROIDAL BUBO. (Author's case.)

SECONDARY LUES

**Second Period of Quiescence.**—This begins after the appearance of the initial lesion. During this period, the virus first extends from the lymphatics connected with the initial lesion to the first group of glands. As the primary lesion is usually genital, the glands first involved are those of the inguinal region. From this point, the infection extends up the main lymph channels and plexuses to all parts of the interior of the body tissues and to the periphery. The glands in the groin are easily detected. They are usually small, varying in size from a very small pea to a large shell bean, and have the feel of recent glandular enlargement in that they are elastic and succulent. Sometimes a number of glands in the groin coalesce and form a tumor called a bubo. The next locations in which the lymphatics can be felt are in the chains extending along the neck and upper extremity. In the former case, they are behind the sterno-cleido mastoid muscle, posterior cervical glandular enlargements and also behind the ear (postauricular). In the upper extremity, they are principally felt in the epitrochlear region, which is on the inner side of the humerus just above and slightly anterior to the epicondyle. From there the virus extends along the lymphatic chain to the axilla, where there are numerous glandular enlargements. The axillary cannot be so distinctly felt as those in the groin, the corresponding location of the lower extremity, on account of the fascias and fat in this location and also because they are situated in a hollow in which palpation is not satisfactory. The inguinal, postcervical, postauricular and epitrochlear regions are then the principal localities where lymphatic enlargements can be noticed.

There is a certain despondency that comes with the beginning of lues which is often followed by one of buoyancy and later by a feeling of indifference that is difficult to understand.

Just before the onset of the secondary stage, the patient frequently has certain constitutional manifestations of the disease, such as headache in the frontal

region, especially at night, pain in the bones, usually the ribs, sternum and bones of the lower extremity, and in some cases a certain amount of fever is present. The elevation of temperature is usually proportionate with the amount of pain present and with the character of the eruption. These constitutional symptoms are very slight or may not be noticed before the macular eruption occurs. They are more marked before a papular eruption, and frequently quite extensively felt before the appearance of the pustular eruption. In the cases in which a pustular eruption is very marked and extensive, the febrile reaction and the headache and pains may be as extensive as before the onset of smallpox.

**Secondary Stage.**—The virus, having passed through the lymphatic system and entered the circulation, gives rise to the eruptions on the skin and mucous membrane. On the surface of the body, the most marked eruptions are the macular or erythematous, fine and coarse papular and lenticular; fine and coarse pustular, impetiginous, erythematous and vesicular. Mucous patches, sometimes macular in appearance, at other times flat moist papules, are also found on the skin and mucous membrane of the throat, mouth, nose and genitals. These eruptions differ in the time of their appearance.

A secondary eruption may appear at any time from six weeks to three months after the initial lesion, or it may never appear; or, what is more probable, it may appear, but never be noticed. It is easy to see how the presence of a nonulcerating initial lesion of a mild type on the genitals in a location where it is not conspicuous may escape notice in the case of a workingman or woman, especially if the patient has not the bathing habit. It is also easy to understand how a very mild macular eruption, breaking out on the chest or back of workingmen or women, may come and go unperceived if they have the habit of sleeping in their underclothes, arising early in the morning, washing the face and hands and quickly beginning work about the house or going out to work. In such cases, even if there had been headache, pain in the bones, or some transitory throat trouble, it would have been attributed to a bad cold or grippe. Unrecognized lues has been estimated as present in three per cent of the cases in men and as high as eighteen per cent in women.

Macular Syphilids.—The erythematous or macular eruption usually appears in about six weeks, on the abdomen and thorax (Fig. 925). On the back, it is generally over the ribs, in which latter case the lesions follow the course of the intercostal vessels and nerves. Such an eruption frequently involves the upper part of the chest, and the head, face and neck, and it may also involve the extremities, palms and soles, although it is most common on the abdomen and thorax. Along the male and female genitals, the macules sometimes hypertrophy, forming condylomata, especially where the adjoining surfaces predispose to maceration. Macules last from a few days to a few weeks, generally—I may say from one to three weeks—fading gradually. They are slightly pink or red in color, flat or slightly elevated above the surface, and become bleached

hen the finger is passed over them with slight pressure. During their presence ome lesions may disappear and new ones break out, either in the same place or lsewhere.

FIG. 925.—MACULAR (ERYTHEMATOUS) SYPHILID. (After Fox.)

*Annular Syphilids.*—An erythematous eruption may be annular in form hen several rings or parts of rings coalesce together on the neck, forehead, oulders and chest. Patients often consider them ringworms; but the latter are sually of longer duration. Seborrhea often participates in this process, giving ise to greasy scales.

PAPULAR LUETIC LESIONS.—They consist of a circumscribed infiltration to the superficial layer of the skin. There are two varieties, conical or miliary d lenticular or flat. They are sometimes spoken of as fine or coarse papular, cording to their size.

Papular eruptions usually appear later than the macular lesions. If a sh appears in six weeks, it is usually macular; whereas a papular eruption

rarely appears before two months, although a macular or a papular eruption may appear at any time from six weeks to three months following the initial lesion. A papular eruption may follow a macular, or it may be present at the same time with the macular lesions, in which case it is called a maculo-papular eruption, or it may occur in cases in which a macular eruption never appears.

Fig. 926.—Coarse (Lenticular or Flat) Papular Syphilid. (After White and Martin.)

*Fine Papular Variety.*—Papules are usually of the fine conical variety, varying in size from a pin head to a French pea. They are pinkish red in color. The eruption usually begins on the extremities where it is the thickest and is also liable to spread over the abdomen, thorax and face. About the genitals and the testes the papules may form elevated mucous patches or condylomata.

*Coarse Papular (Lenticular).*—Lenticular lesions are flat like small beans or lentils (Fig. 926). They are small and large. The small may form a general eruption and, like the conical variety, they are seen as pink-red and later coppery spots on shoulders, neck, thorax, forehead, sometimes a few about nose, mouth and chin, backs of hands, sides of thigh and on the genitals. One of the favorite seats is the forehead about the hair margin where they form a row called the corona veneris and are of large size.

Large flat papules may be from a quarter to half an inch in diameter. They are also found on the neck and genitals.

Fig. 927.—Papulo-squamous Syphilid. (After Fox.)

*Papulo-squamous (Psoriatic) Lesions.*—They are often present on the palms, soles and flexor surfaces, but less frequent on the elbows and knees than

those of psoriasis vulgaris. They are less symmetrical but more extensive than those of psoriasis. They begin as small papules and enlarge peripherally. The scales are quite profuse and when removed show a red base on which there are no bleeding points. They are rare in early life.

Scaling papular luetic lesions of the palms and soles may occur at any period of the secondary stage and run a chronic course; or they may occur with tertiary lesions. They are elevated, of a deep red color, covered with scales. Sometimes miniature colorless corns appear on the palms which may be slightly tender. The scaling papules are called luetic psoriasis of the palms and soles. One hand may be alone attacked—the one used in work.

Fig. 928.—Papulo-squamous (Palmar) Syphilid. (After Fox.)

The small conical papules that have just been considered change in form; they are sometimes umbilicated, whereas at other times they may become vesicles or pustules by deposits of serum or pus at the apex, which form crusts and drop off. On the back they may resemble acne.

Pustular Syphilids.—The pustular eruptions are the most severe of the different forms and are not as common as the erythematous or papular. They may occur at any time during the secondary stage, as well as in the tertiary. They vary in size from a pin head to a dime. There are different varieties of pustular lesions. In shape they are acuminate, rounded or flattened. They are firm in the beginning and their bases are infiltrated. They may begin as a papule or a pustule. They may be very sparse or exceedingly numerous, varying from one or two solitary lesions to hundreds (Fig. 929). They occur usually on the lower extremities, arms and back. They are not so marked on the face, except the small variety.

The *papulo-pustular* are the earliest of these lesions, causing generally no destruction of skin. Later varieties are extensive, deep and leave cicatrices, brown or yellow pigmentations or white tissue.

*Acneiform Lesions.*—They attack the hair and sebaceous follicles; they are papular-pustular and vary in size from a pin head up. The eruption is at times

preceded by severe constitutional symptoms such as severe headache and backache, high fever and rapid pulse. Lesions develop in from twenty-four to forty-eight hours. They appear on the face, back, neck and shoulders, then trunk and

Fig. 929.—Small and Large Pustular Syphilids. (After Fox.)

extremities. They differ from the lesions of acne vulgaris, as the lesions of acne are never accompanied by acute constitutional symptoms and generally appear at puberty and are confined to face and back, and present papules, pustules and comedones.

*Impetiginous Lesions.*—These lesions occur in groups and are called impetiginous on account of the shapes and configurations of the lesions. They are situated in the superficial layer of the skin, and are pustular, crustaceous lesions, not distinctly circumscribed. They often involve an extensive surface and may become serpiginous, extending and healing behind. The pustules dry quickly, forming crusts, or pustular crustaceous lesions.

*Variolaform Eruption.*—This is quite rare and is composed of superficial pustules having a rather thin epidermis covering the pus. The base of these lesions is but slightly thickened. It begins with red areas which develop, in a day or two, into pustules that are surrounded by a deep red areola. When fully developed, they flatten slightly in the center, becoming umbilicated. They occur on the forehead, on the abdomen, on the genitals, at the junction of the skin and mucous membrane and on the inguinal region. They are not attended by much febrile movement.

FIG. 930.—LARGE FLAT PUSTULAR (ECTHYMATOUS) SYPHILID. (After Fox.)

*Large, Flat Pustular (Ecthymatous).*—These are of two varieties—the superficial and the deep. The superficial is the earlier eruption and may appear any time during the first year of the disease and usually consists of a large number of pustules. The pustules are small, beginning as slight elevations of the skin which in a day or two become pustules on which crusts are formed by the drying of the pus. They grow in proportion to the bases of the pustules and become brown in color and round or conical in shape. As they further increase in size, they become flattened and the base becomes a dull red. Beneath the crust is an ulceration, involving the superficial layers of the skin, having a smooth floor covered with pus. The eruption often begins about the face and neck, spreading to the extremities and the trunk, particularly the posterior surface.

The latter, the deep variety, may be an intermediary or a late lesion, usually late. It resembles a nonspecific ecthyma.

It begins as a papulo-tubercle. A round or oval elevation is first seen, upon which a quantity of yellow pus soon forms and dries into a brownish-black

crust, due to the presence of blood with the pus. When fully formed, it is about the diameter of a dime or a cent. The crust is usually rounded and beneath it is a deep, punched-out ulcer, with sharply cut edges and a red-gray surface covered with foul pus. The most frequent seat is the front and outside of the legs; they also form on the arms, the lower part of the trunk and the face. It is sometimes precocious, in which case it is very severe, and the patient is usually markedly cachectic (Fig. 930).

*Rupia.*—Rupia (Fig. 931) is another luetic manifestation that may appear primarily during the first year of the secondary stage of the disease, although

FIG. 931.—RUPIA. (After White and Martin.)

it belongs to the tertiary stage. It is a pustular crustaceous lesion, consisting of a number of laminated crusts on a deeply infiltrated and ulcerating base.

A rupial lesion begins as a flat pustule which develops into an ulcerating base with a small crust. As the ulcer increases in size, the crusts become larger and each succeeding crust forming pushes the one before it up until the mass

of crusts assumes the form of a laminated horn, which is sometimes half an inch or more in length. When the crusts are removed, an ulcerated surface is seen bathed in thick pus. The depth of this base is not as great as that of the severe ecthymatous form or that of a gumma. The reason why the crusts pile up in this way is because the pus is thick, is secreted slowly and dries quickly.

*Precocious Gummata.*—The precocious gumma, occurring in the early part of the secondary stage, is not generally understood by the profession. There are three forms, the generalized, localized and neurotic.

(1) The generalized form comes on about two months after the infection. They appear as small tumors under the skin, grow, become red, soften, are either absorbed or break down. When they break down, fluctuation is usually noticed, a covering breaks, the fluid escapes, an unhealthy fungating ulcer covered with pus remains, surrounded by a deep red, undermined border. They are not so deep-seated as tertiary lesions.

(2) The localized form appears as early as the fifth month. The evolution of the tumors is slow and indolent. They are not quite as marked as the former variety.

(3) The neurotic form resembles erythema nodosum. It may occur either in the early or late secondary period and is often accompanied by severe symptoms, such as neuralgic pains, headaches, pain in muscles and joints and fever from 101° to 104° F. may be present. The seats of predilection are the forearms and legs, sometimes the shoulders, thighs and trunk. The eruptions are red, round or oval, and resemble a bruise. They either undergo resolution or soften noticeably.

Pigmentary Lesions.—As a result of any of the lesions just described, there may be a disturbance of the distribution of pigment, absolutely white areas may occur in places or a white circumscribed area may be surrounded by brown pigmentation. There may be a circumscribed area of pigmentation or irregularly distributed colorless and dark brown skin.

Special Manifestations.—The special manifestations of secondary syphilis are those of the nose, throat, mouth, eye, nails and hair.

*Lesions in the Mouth and Throat.*—Those of the throat and mouth are the most marked. By throat I mean pharynx or larynx; in the former case the patient will complain of difficulty or pain in swallowing, in the second, hoarseness or difficulty in speaking. In both of these instances, the trouble may be due to a congestion and infiltration of the tissues, or to the presence of mucous patches.

In the pharynx, the lesion may be easily seen as a syphilitic angina or in the form of mucous patches. A syphilitic angina closely follows the arches of the pharynx and soft palate, showing itself as an area of slight thickening and reddening, and often a marked line of demarcation separating it from the healthy tissue.

*Mucous patches* in the mouth or throat usually appear as small papules resembling cankers, which soften, leaving a pultaceous base, white or gray in color, or they may be raw and red. When they occur on the side of the tongue, it may become deeply fissured. About the fauces and on the sides of the mouth, flat papules may break out, having a thick white deposit upon the surface.

Fig. 932.—Mucous Patches of Lips. (After White and Martin.)

The *eye* is involved in many ways in lues. A *luetic iritis* is one of the principal varieties and may occur in one or both eyes. The eyes are painful, especially when exposed to the light, and the conjunctiva is congested. The iris is more or less clouded and a red circle forms just outside. There is also pain on accommodation. Later, adhesions may form, interfering with accommodation and especially with dilatation of the pupil, and if no treatment is employed, *synechiæ* often develop. *Ulcerations of the cornea* may also be present. A *panophthalmitis* which is a general destructive inflammation of the eye sometimes results.

*Luetic Alopecia.*—This is one of the common symptoms. The hair, beard, eyebrows and the hair of the pubes and axilla may be involved. There are two varieties: a simple thinning of the hair, or its loss in circumscribed patches. The first form begins suddenly and consists simply of the falling out of the hair, the only local scalp manifestation being some rather dry and scaly lesions. In the second form, in which the result is a moth-eaten appearance, the patches are irregular, round and oval. The hair follicles may be involved, during a macular, papular, pustular or a general eruption. Alopecia may occur at any time from the end of the third month to that of the second year. The hair follicles may be destroyed by pustular lesions and the ulcerative changes cause permanent baldness. The prognosis is good, except in the cases in which the hair follicles have been destroyed by the suppurative process.

*Affections of the Nails.*—Primary disease of the nails is called *onychia.* When the trouble begins outside the nail and involves it, it is called perionychia. It usually occurs in the first two years of the disease, but it may occur later. In the dry form, the nail becomes thick, brittle and serrated, whereas the epidermis around it is thick and scaly about the margin. *Perionychia* may be ulcerative or nonulcerative; the border of the nail is thick, due to specific in-

filtration, of a red color and scaly surface. Ulcerative perionychia occurs during the secondary period. It begins with small ulcerations or fissures at the nail margin. The ulceration extends under the nail, forming pus, until the whole nail is finally thrown off. If the base of the nail has not been too extensively destroyed, the new nail grows, which in some cases is perfect. Sometimes a diffuse perionychia takes place, in which case there is a redness of the distal part of the finger, which becomes club-shaped. The nail undergoes rapid necrosis, accompanied by a discharge of foul pus.

*Mucous patches* may occur on the genitals, in which case they are different from those in the mouth. On the mucous membrane, there are usually slightly elevated flattened papules or macules with a whitish secretion or coating upon them. When they occur between moist adjoining surfaces, or where the mucous membrane touches the skin or the margin of the prepuce, about the vulva in women, about the anus in both sexes, these lesions are of a dark-red color, flattened, infiltrated and covered with a thick, foul, whitish deposit.

Fig. 933.—Mucous Patches about Anus. (After White and Martin.)

Prognosis.—If the patient is placed upon treatment at the beginning of the secondary stage and it is continued for two years, the disease should be cured, and there should not be a tertiary stage, the whole system having been freed from the luetic virus. This does not always apply, however, and whereas tertiary trouble often develops in patients who have neglected treatment during the secondary stage, it may also develop in those who have been conscientious in carrying out the treatment and in those who have never had a secondary stage—a rare condition and yet one that may occur.

## Tertiary Lues

**Third Period of Quiescence.**—Before the development of tertiary lesions and after the apparently last symptoms of the secondary stage, there may be a period lasting from a few months to twenty years or more. During this time the disease has been undergoing resolution and elimination in most parts of the body, but has not been completely eliminated from certain localities or areas. Tertiary lues seem to have a predilection or selective action for certain tracts or systems of the body, and even for certain parts of these tracts, which it attacks and affects to a greater or less degree by a destructive process. The reason of the predilection for one or another tract I do not understand, and

the question needs more pathological investigation. It may be due to a certain natural weakness in this particular system or tract, a predisposition to disease in it, an unusual strain that has been brought upon it or some injury to it.

**Tertiary Stage.**—It seems to me that the character of lues has been undergoing a change during the last twenty-five years, owing to a better knowledge of the treatment of the secondary stage and that consequently tertiary manifestations are now much less frequent and less severe than they formerly were. I have been treating and watching cases of lues that I have had in private practice for over twenty years, and the occurrence of the tertiary stage has been very, very rare. In fact, I have had almost no cases among the patients treated by me until discharged as cured.

The systems or tracts that are principally involved are the cutaneous, the genital, the respiratory, the osseous, the circulatory, the nervous and the gastro-intestinal. We can, of course, observe better the manifestations that occur on the skin than elsewhere, and probably next to the skin, the genital and respiratory tracts, and after this the osseous system. The nervous lesions can be only symptomatically observed, as can the circulatory; whereas the gastro-intestinal tract and the contributing organs, such as the liver, have yet to come in for considerable investigation.

Cutaneous Manifestations.—On the skin, the lesions can be divided into the two great varieties of tubercular and gummatous syphilids.

*Tubercular syphilids* are so called because they resemble large papules or tubercles. They involve the entire thickness of the skin. In the dry form, a patch appears somewhere on the skin, which may be small or extensive, composed of flat or roundish circumscribed papules, with a smooth or sometimes

Fig. 934.—Non-ulcerating Tubercular Syphilid (Slightly Infiltrated Form). (After Fox.)

glazed surface, varying in color from a light pink to a dull red. When disappearing, they change to a light yellow or brownish-yellow color (Fig. 934). They are usually fairly firm and might even be called indurated. The lesions have a

tendency to arrange themselves in circles and segments of circles, which is an important diagnostic point. As the eruption progresses, the lesions undergo

FIG. 935.—TUBERCULAR CRUSTACEOUS SYPHILID. (After Fox.)

an atrophic change, and a slight desquamation may be present on the surface; while, as they disappear, the discoloration frequently following it may disappear and thin white depressions or cicatrices finally result. These may become pustular or ulcerative, but are usually of the dry form.

The lesions may be solitary and scattered at first, but later become multiple and aggregated in one or more groups. The solitary lesions are liable to develop into an ulcer with a thick crust and considerable inflammation. The lesions in the groups vary in size from a small papule to a bean. A diffuse luetic infiltration often takes place between the tubercles which gives the whole area a reddened hue. Thick scabs may develop on these areas forming tubercular crustaceous syphilids (Fig. 935). Large areas are sometimes involved on the body or limbs, but never symmetrically. These areas tend to ulcerate at their edges, especially when they become serpiginous.

FIG. 936.—SERPIGINOUS SYPHILIDS. (After Fox.)

*Serpiginous Syphilids.*—Both the dry form and the suppurating frequently extend, the lesions disappearing and leaving cicatrices which may be white, or may first be red and later become white. These groups of tubercular syphilids are called serpiginous, because they extend quite a distance by an irregular route, sometimes covering a number of inches, and may last for months and years unless checked by treatment (Fig. 936).

*Discolorations of the Skin.*—Ecthymatous patches may leave brownish stains or white depressed scars which are quite typical of lues. The tubercular syphilids, occurring in groups, both dry and suppurative, may in healing leave white depressions and also areas of brown pigmentation irregularly arranged according to the scattering of the pigment that takes place during the skin involvement.

Fig. 937.—Ulcerating Gumma Becoming Confluent. (After Fox.)

*Keloids.*—In all pustular syphilids, but principally in the precocious form occurring in the secondary stage, hypertrophy of the base of the lesion may take place, leaving a thick white elevated cicatrix with a flat top, having a white and lardaceous appearance. They are called false keloids.

*Gummata.*—Gummata develop as one of a few *subcutaneous*, well-rounded, painless and indolent nodules or tumors. They are first noticed when about the size of a pea, and may become the size of a cherry or larger. The skin over them is at first unaltered. They are composed of tissue resembling granulation tissue. They may undergo resolution with treatment, but otherwise they slowly increase in size, involving the overlying part of the skin. They later become red or purple and finally break through the skin, discharging a thick, gummy serum. When an active inflammation has been present in the lesion, the contents may be partially or wholly purulent, gummy pus. The resulting ulcers have well-rounded edges, are cleanly cut, with a sloughy base, extending to the *subcutaneous*

*tissue* or even deeper. Gummata of the skin usually occur below the knees (Fig. 937).

*Gummatous periostitis* and *osteoperiostitis* are also frequent and are sometimes mistaken for gumma of the skin. They usually occur on the tibia, sternum, clavicle, scapula and the bones of the skull, especially the frontal (Fig. 938). They appear as nodes beneath the integument. They frequently soften and discharge through the skin. The bone is often deeply involved. The bony canal of the tibia may be opened into or, in the case of gumma of the sternum, the anterior mediastinum may be opened. The most marked case that I have seen was one of the frontal bone in which a clean, rounded hole the size of a twenty-five-cent piece existed through which the meninges and the pulsations of the brain could be plainly seen.

Fig. 938.—Gummatous Osteoperiostitis. (After Taylor.)

Lues of the Genito-Urinary System.—This is not so frequently involved as the respiratory passages. Gummata may appear on the skin or the glans of the penis in men or on or between the labia in women, and by extension and destruction invade the urethra, thus interfering with the urinary stream by stricturing the canal. I have had cases with quite extensive destruction of the urethra that has been caused in this way, leaving an irregular opening in its wall which has been at times impossible to repair, owing to the lack of tissue, caused by the cicatricial retraction about the margin of the opening.

*The Testes.*—The testicle is, however, the part of the genital tract principally involved in the tertiary stage. Either the orchid or the epididymis may

be affected. There are two forms of luetic orchitis, the chronic sarcocele and the gummatous form, although these forms are sometimes combined.

*Sarcocele* is a chronic luetic infiltration of the orchid, either unilateral or bilateral, resulting in a slow formation of fibrous tissue. The orchid is smooth, hard and uniformly enlarged, sometimes to more than double the normal size. A varying amount of fluid may be present in the tunica vaginalis, in some cases sufficient to give rise to a hydrocele of large size. When there is much formation of fibrous tissue, the orchid contracts down later to a small hard mass that is round and smooth, having a peculiar nontesticular feel.

*Gumma of the orchid* presents quite a different appearance, although it may be preceded or complicated by a sarcocele. One or more nodules form on the orchid, usually on the anterior surface, giving it an irregular appearance. The scrotum over these nodules may later become involved, reddened and adherent. The nodules then soften, ulcerate, break down and discharge. The result is an irregular orchid, atrophied and hardened in the places that have been invaded by the gummata. Hydrocele also accompanies this process at times.

*The Epididymis.*—The epididymis is not often attacked by lues without a simultaneous lesion of the testicle, although this may happen. It resembles closely a gonococcal process in configuration, only it is slightly more rounded. It is, however, chronic, whereas the gonococcal epididymis is acute. There is no pain, but simply a sensation of heaviness. *Gummatous epididymitis* may also occur. In such a case, there may be one distinctly circumscribed gumma that becomes large, dense and hard, and remains in this condition for a varying time, generally breaking down sooner or later and discharging; or else undergoing absorption and contracting. There may be a number of them at times, resembling somewhat a case of tuberculous epididymitis.

Tertiary Lues of the Respiratory Tract.—The respiratory tract is the seat of marked tertiary lesions. The greatest tissue destruction is produced through gummatous infiltration of the mucous membrane, a gumma of the periosteum or of the bones or cartilage.

A *gummatous infiltration* is a diffuse red thickening of the mucous membrane in which there are no tumors or circumscribed areas of gummatous formation. It often causes much destruction of tissue. The external nose may be involved by a gumma which begins in the subcutaneous tissue and may destroy a portion of one of the alas. The nasal bones may sink in as a result of the destruction of the cribriform plate of the ethmoid and the vomer, which are the supporting structures, due to gumma and necrosis; but the typical luetic saddle-nose is more frequently due to necrosis of the nasal bones themselves as the result of gumma.

*The Palate.*—When the necrotic process invades the palate bone, it begins as a gumma of the periosteum in or near the middle line, appearing as an elastic swelling, often multiple, which may rapidly break down and ulcerate,

involving the bone and resulting in its necrosis. A piece of dead bone may be thrown off or be so loosened that it can be extracted with forceps, leaving a perforation between the nose and the mouth. Besides the deformity in such a case, there is also a transmission of the voice sound into the nose, seriously affecting speech.

There may also be a destruction of the tissues of the soft palate due to gumma. Here the gumma may be either circumscribed or diffuse. In the first case, it may give rise to a circumscribed opening or a communication between the nose and the mouth. Sometimes there are two or three such communications or there may be communications between the mouth and nose both through the hard and the soft palate. Sometimes a diffuse gumma of the soft palate may develop very rapidly, destroying the uvula and the greater part of the soft palate in a few days. In the fauces, one or both pillars may be the seat of a gummatous process, causing a destruction and deformity, which may be either circumscribed or diffuse. In my own cases, it has usually been of the circumscribed form.

*Larynx.*—Circumscribed gummata as well as diffuse gummatous infiltration are in this region principally found on the epiglottis and the posterior laryngeal wall, also on the vocal cords. As the result of ulceration and subsequent contraction of scar tissue, there may be a chronic hoarseness and difficulty in articulation. Respiration may also be interfered with through partial stenosis of the larynx.

*Lungs.*—The lungs may be attacked by lues, usually in the form of a gummatous pulmonitis, sometimes called luetic phthisis. It usually occurs in the late part of the tertiary stage, and gives rise to symptoms resembling an ordinary pulmonary phthisis, except that the constitutional symptoms are at first less marked and the course is slower.

Some Forms of Lues of the Nervous System of Interest in Urology.—Among the diseases of the nervous system due to lues that are of interest in this work, are hemiplegia, due to (1) luetic endo-arteritis and (2) gumma of the brain; paraplegia due to (3) acute luetic meningo-myelitis, or (4) gumma of the cord; (5) Erb's spinal paralysis (luetic ataxic paraplegia); (6) posterior spinal sclerosis (locomotor ataxia); and (7) dementia paralytica (general paresis).

The *headaches* due to luetic affections of the brain and its membrane are interesting. When they occur during the secondary stage, they are felt principally in the forehead, but also in the temples and back of the head and they vary from a slight headache to a very serious one. They seem to be more severe in women. The headaches may be continuous or intermittent; the latter are most frequent, the attack usually coming on toward evening.

Headaches of the tertiary stage are, however, more important, as they are forerunners of serious luetic sequelæ such as hemiplegias, epilepsy, etc., but

usually precede these complications by a month, a month and a half or longer. The head feels heavy and compressed, as if it had been beaten. If the pain is circumscribed to a very small well-defined area, it indicates a gumma. It also precedes paresis which usually occurs between the ages of twenty and forty.

Paralysis developing during sleep is probably due to thrombosis and during the hours of mental activity to a rupture of the lenticular striate branch of the middle cerebral.

*Cerebral Gumma.*—Etiology.—The cause of gumma of the brain is often attributed to a nervous temperament and to an excess of mental work. It is probable that a neurasthenic tendency predisposes to such conditions, also excessive mental work, worry and an overindulgence in alcohol and other stimulants. The principal reason, however, for its development as in late troubles elsewhere is a neglect to carry out a thorough and sufficient treatment during the secondary stage. *Cerebral gummata* usually develop from three to ten years after the infection, although they may not occur until a later date.

Pathology.—Gummata may be single or multiple. They usually occur in groups of three or four and grow from the dura, the subarachnoid space, the base of the cerebral hemispheres or on the convexity of the frontal convolution. The size and appearance do not differ from those of gumma in general. They are hard and solid and may be imbedded in congested brain tissue. They vary in size from a pea to a small plum. Gummata of the brain do not grow rapidly. They may involve the blood vessels and give rise to an area of softening. They are more often found on the surface of the brain than in its substance. Gummata of the bones of the skull are more frequent than gummata of the brain tissues and may involve meninges and thus cause pressure upon the brain. Gummata of the dura are more common than those of the pia and occur on either surface of it. The arteries may be obstructed or obliterated either by the compression of the gumma or by the invasion of gummatous material. Small gummata form along the arteries and cause pressure on both the arteries and the brain, thus interfering with the nutrition of the part. The parietal portion and the base of the brain in the sphenoidal region are the most frequently affected.

Symptoms.—Severe headache is the principal symptom, more marked at night and restricted to a limited area. There is usually a failure in memory and mental power, and mental depression, nervous irritability, excitability, insomnia and other nervous symptoms, among which are anorexia, dyspepsia and vertigo.

Diagnosis.—This is based on the history, the symptoms and other signs of lues; the Wassermann reaction and the response to luetic treatment.

*Luetic hemiplegia* is an attack of partial paralysis on one side, occurring in luetic individuals, usually under forty years of age. It may come on during the first few months of the disease, or not for several years later.

*Luetic Endo-Arteritis.*—Etiology.—Hemiplegia may be due to either arteritis or endo-arteritis, usually the latter, and situated in the smaller arteries of the brain. It occurs principally in the middle cerebral arteries supplying an area in which there is not an active collateral circulation, and thus interferes markedly with the functioning of the part of the brain to which the arteries go.

Pathology.—There is a cellular infiltration into the walls of the artery, which infiltrate is converted into fibrous tissue. This thickens, stiffens, narrows or shuts off the vessel at the part involved, thus interfering with the blood current or giving rise to the formation of a thrombus. Gummatous endo-arteritis is another form, but much less common.

Symptoms.—The patient may have had several attacks of headache on one side, or of so-called vertigo, when he felt queerly and partially dazed, but may have been able to recover from it by remaining quiet or taking some anti-spasmodic or stimulant, which he carried with him, or he may have had occasional jerking of the arm or leg of one side, or muscular spasm, numbness or neuralgic pain. When the attack finally comes on, he feels a loss of power on one side, although he may not and usually does not lose consciousness, but may be more or less befogged mentally. This may come on quite unexpectedly, but he may be able to rest or recline against something. Sometimes he cannot speak, but is able to write what he wants and directions as to where to be taken. When the paralysis is partial and collateral circulation is readily established, there may be but little functional disturbance and the condition may greatly improve or even disappear in a few days, as is the case when the attack has taken place during the first few months of the disease. When the trouble comes on later, the patient's health is not perfectly restored but improved, as in this case the attack does not occur until fairly extensive changes have taken place in the vessels.

Prognosis.—Patients of mine who have had the initial lesion fifteen or more years ago and the hemiplegic attack anywhere from two to fifteen years later, are now able to go about and take exercise, such as walking and swimming, while some play golf and tennis and others run their own automobiles; and yet each one thought at the time that he would either never recover or that he would remain a hopeless paralytic for the remainder of his life.

*Luetic Epilepsy.*—This resembles closely the ordinary type and like it is divided into two forms, the grand mal and the petit mal. Headaches are frequent and usually increase in severity before an attack.

Symptoms.—In the grand mal there is loss of consciousness, tonic followed by clonic spasms, frothing at the mouth and stertorous respiration. There is no rule regarding the frequency with which the attacks take place, but they occur with a seeming regularity every two to four weeks, lasting from a few minutes to a few hours.

In the petit mal, there is a loss of consciousness with convulsions of a tonic

nature consisting of a muscular tremor of short duration. This follows a peculiar turning tendency as shown by a twist of one side of the face, a turn of the tongue to one side and also a turn of the body, associated with vertigo and weakness.

Prognosis.—Cases of luetic epilepsy that has been preceded by headaches and other luetic symptoms for a long time before the attacks have come on usually do not recover, although they may be benefited. Those, however, that have not been preceded by such a history usually make a better recovery and often a permanent one, especially those having petit mal.

*Paraplegia Due to Luetic Meningo-Myelitis.*—This is the most common manifestation of spinal lues, and a frequent cause of paraplegia.

Pathology.—The spinal meninges are usually affected together, the pia and the arachnoid becoming agglutinated through loose, newly developed connective tissue with the internal surface of the dura on the one hand and with the substance of the cord on the other. The acute form of luetic meningitis appears as a diffuse small-cell infiltration of the meninges, especially around the vessels, and as a proliferation of young connective tissue. The most common form is represented by a circumscribed proliferation of cells, constituting the formation of minute gummata and giving rise to a miliary gummatous affection of the spinal meninges.

The vessels are affected in the same way as those of the brain, that is, by changes in their walls leading to a narrowing of the lumen and thrombosis. The veins are generally involved in addition to the arteries. Hemorrhage into the cord may take place owing to the vascular lesions.

Symptoms.—The actual cord symptoms are often preceded by those on the part of the brain, such as headache, vertigo, aphasia, paralysis of the motor nerves of the eye and the optic nerve. One of the earliest symptoms is a weakness of the bladder, usually shown by urinary incontinence. The bladder disturbance may resemble the form that accompanies a paralysis of its detrusor muscles, or that of a weakness of the vesical sphincter. A combination of these two forms is not uncommon. The bladder symptoms are often the main reason why the patient seeks the physician. The weakness of the bladder is also a very obstinate symptom and not infrequently persists for a long time after the motor and sensory disturbances have been controlled by suitable treatment.

Diagnosis.—In all forms of meningo-myelitis the symptoms are apt to vary in severity at different times, and this is considered characteristic of gummatous meningitis. The meningitic symptoms are sometimes very distressing, but in other cases may be very slight. As the disease progresses the patient begins to suffer from *paresthesia*, darting pains and a sensation of weakness in the lower extremities. The sensory disturbances are usually less marked than the motor, which may increase up to complete paraplegia. The tendon

reflexes are generally increased at the early stage of the disease. The skin reflexes may be diminished or increased.

*Gummata of the Cord.*—Gummata of the cord are rare, but, when present, they may occur in any part of the cord. They are more frequently, however, secondary to gummata of the meninges, in which case they are on its surface and adherent to its meninges. They are of variable size, multiple or solitary, but the formation of large gummata is less common in the cord than in the brain. Gummatous thickening of the spinal meninges is also much rarer than the corresponding process in the cerebral meninges. The cord and spinal meninges are usually involved together.

Symptoms.—The symptoms depend largely upon the location of the gummata in the cord, the degree of pressure caused by their presence and the extent of implication of the nerve roots. They resemble closely the symptoms of spinal tumors, with persistent radiating pain and the gradual onset of compressive paraplegia.

Diagnosis.—The diagnosis of gumma is based upon a clear luetic history and the effects of specific medication.

*Erb's Spinal Paralysis.*—This disease, which is also known as luetic ataxic paraplegia, is not admitted by all neurologists as a clinical type of disease that is distinct from primary lateral sclerosis.

Pathology.—This consists either of a simple degeneration of the fibers of the lateral and posterior columns of the cord, or the disease of the columns combined with a diffuse chronic myelitis and an involvement of the spinal vessels and meninges.

Symptoms.—The salient features of the disease are the very gradual development of spastic paresis of the lower extremities, a spastic gait, sexual failure or impotence and weakness of the vesical sphincter, with some urinary incontinence. The tendon reflexes are greatly increased. Sensory disturbances are slight or absent. The upper extremities, the cranial nerves and the pupils are unchanged. The patient's intelligence is not impaired. Improvement is not uncommon in this form of spinal paralysis, and the stage of complete helplessness is not often reached.

*Posterior Spinal Sclerosis* (Locomotor Ataxia, or Tabes).—Lues is at present considered to be by far the most common and most important cause of locomotor ataxia, and, while I do not consider it to be the cause in all cases, I feel that, if the Wassermann test can be relied upon, seventy-five per cent of the cases are luetic. Fournier's statistics show it to be present in ninety-three per cent of his tabulated cases, which agrees with the percentage of some other statisticians.

Pathology.—The most obvious gross change consists of an overgrowth of the connective tissue, leading to sclerosis of the posterior columns of the cord. The disease is known to extend in certain cases beyond the sensory system in the cord. No traces of gummatous material have as yet been detected.

Symptoms.—A very prominent symptom of the early or preataxic stage is pain of a sharp lancinating character most common in the calves of the legs and in the back. It is followed by loss of muscular power, beginning in the lower extremities. Incoördination of movement is one of the leading symptoms and is much more marked than the loss of muscular power. The urinary tract is also involved in this trouble, showing itself at first in an increased desire to urinate, associated with some dysuria. As the disease progresses, retention of urine follows, giving rise to a constantly increasing dilatation of the bladder with overflow incontinence. Cystitis is usually present in the cases that come under my care. Finally the kidneys may become involved, and the patient may die from a renal affection.

Loss of the deep reflexes is a very early and highly important symptom of tabes; the knee and ankle jerks gradually diminish, one sometimes persisting longer than the other, but they finally disappear entirely. This symptom, together with the lightning pain and the Argyll-Robertson pupil, which reacts to accommodation but not to light, makes a combination that is practically pathognomonic of tabes.

*General Paresis* (Dementia Paralytica).—This disease is probably due to lues, as the Wassermann test is positive in practically all of the cases.

Pathology.—The brain is small and below the normal weight, the atrophy affecting especially the anterior and middle lobes. The meninges are thickened and the cerebro-spinal fluid is greatly increased. The lateral ventricles are usually dilated, and dilatation of the fourth ventricle is practically constant. Histologically, there is degeneration and atrophy of the nerve fibers and ganglion cells, with more or less extensive overgrowth of the neuroglia or supporting substance. The small blood vessels are often greatly increased in number.

Symptoms.—The onset of the disease is usually insidious, and the patient gradually sinks into a state somewhat similar to dementia. There is usually a prodromal stage, characterized by severe headache, mental deterioration, slowness of speech, tremor of the tongue and lips, unequal pupils and changes in the deep reflexes, which may be either diminished or increased. Vesical weakness and urinary incontinence gradually make their appearance; besides which there may be a loss of control of the rectal sphincter.

The paresis becomes worse and patients do not live more than a few years after showing symptoms of this disease.

*Luetic Neuralgia.*—When it occurs in the tertiary stage and is due to an infiltration into a nerve, it is, strictly speaking, a luetic neuritis; or else it is due to the pressure of a gumma.

Like all other luetic conditions of the nervous system, it tends to become worse at night.

## TREATMENT OF LUES

There seems to have been a decided advance in the treatment of lues during the last few years, but the same old specific remedies are still used, namely, powders or black wash in the first stage, that of the initial lesion; some mercurial during the second stage; and mixed treatment, or potassium iodid internally with mercurials externally during the third stage. The method of using the mercury has, however, undergone numerous changes; arsenic preparations have been found to be of great value, and more has been learned concerning the value of the various cures at certain springs, where this trouble is treated. It is principally the judgment required in treating individual cases, and the degree of intelligence with which complications and sequelæ should be handled, that engage our attention.

**The Treatment of the First Stage of Lues, the Initial Lesion.**—This varies according to the form it has assumed. It may be a dry, scaling papule; a superficial erosion, the most common form of uncomplicated chancre; or an ulceration. The abortive treatment can be tried in these cases, consisting of excising the lesion, and I believe it to be a good procedure to circumcise every patient at the first appearance of a lesion on the prepuce; although it is probable that the lymphatics above the initial lesion have become involved by the time that it has shown itself.

In almost every case of initial lesion that comes to me as such, the treatment is the same, and it is usually attended with success. The lesion is generally in the form of a simple erosion or ulceration, and is treated with a wet dressing of black wash.

The detail of the treatment consists in washing it twice a day with warm water, then placing a thin pledget of cotton on the lesion and soaking it with black wash. Every time the patient urinates, he should shake the bottle and pour some black wash on the cotton. If the initial lesion is an ulceration, it should be cauterized with the silver stick or a saturated solution of silver nitrate, after it has been anesthetized with cocain solution, and then treated the same as an erosion. The cauterization is repeated on subsequent visits if necessary. In case the lotio nigra does not act satisfactorily, it should be changed to a dry dressing of aristol. When a mixed sore is present, it should be treated the same as an ulcerating initial lesion. If it is the dry, scaling papule, I also treat it generally with a wet dressing of black wash. This form of chancre is often at the balano-preputial margin, in which case the preputial orifice is somewhat constricted, and an ointment of ammoniate of mercury, alone, or diluted, is often more efficacious than the solution.

Subpreputial lesions are often found in individuals not suffering previously from phimosis, but in whom the infiltration of the lesion is sufficient to prevent the retraction of the prepuce, and therefore what is a simple lesion

when in a situation where it can be freely exposed, becomes much more inflamed when it is confined beneath the prepuce and irritated by the accumulation of smegma and its own secretions. In these cases, there is often quite an amount of subpreputial discharge and considerable induration, as felt through the prepuce. The method of treating such a condition, is to keep the lesion as clean as possible, and to make a healing application by the best means that can be employed. Here, of course, without an operation, we can neither cauterize the lesion nor make applications in the form of a wet or dry dressing.

The method first to be tried, therefore, is that of a subpreputial astringent or antiseptic injection. This should be given every three or four hours, after first injecting plain water to cleanse the parts. The materials generally used are a weak solution of carbolic acid (1:250) or of mercuric chlorid (1:10,000), or black wash. Apparently enough of this injection remains in contact with the lesion to encourage a healing process, or to reduce the surrounding inflammatory conditions to such a degree that the prepuce can be retracted.

If, however, under such treatment, the condition seems to grow worse instead of better, a dorsal or lateral incision (see Phimosis) should be made through the entire thickness of the prepuce, and, after thorough bichlorid irrigation, the lesion should be cauterized and then treated by local application of a powder or solution and absorbent cotton, as mentioned. This should be followed later on by a circumcision.

The use of hot water is very efficacious in these cases, both before and after the incision; in fact, hot water will often reduce the swelling sufficiently to allow preputial retraction. The affected part can be soaked by this means every two or three hours, or hot cloths can be applied.

Chancre of the meatus occurs in about six per cent of the cases of initial lesion in the male. It is usually in the form of an erosion, and is very obstinate on account of being constantly irritated by the urine passing over it. In these cases a powder is too irritating to apply, and a solution seems to produce the best results. Here, again, lotio nigra appears to be preferable, and should be kept in constant relation to the lesion by means of an absorbent-cotton plug saturated with it, a fresh one to be inserted after each act of micturition, and to be worn until the next act, when another one should be inserted. For the making of the plug see Meatotomy. In addition to this, an alkaline solution or a urinary antiseptic should be given internally to render the urine less irritating.

Extragenital chancres, which occur in two per cent of all cases (according to Julien), are treated in the same manner as those on the genitals, that is, cauterized when necessary, and treated with mild antiseptic or astringent washes or powders.

Sometimes phagedenic ulceration occurs in chancres. This, however, is extremely rare in private practice, usually occurring only in the lowest class

of hospital patients in large cities. In such cases, the slough must be first removed by means of a powder of equal parts of charcoal and iodoform, or a charcoal poultice, or by an application of hydrogen dioxid, after which the bland antiseptic powder above referred to can be used as a dressing. In these cases, tonic and supporting treatment is of the utmost importance—iron and strychnin should be freely given. There are certain constitutional conditions that also are predisposing causes of phagedenoma. They are diabetes, tuberculosis, alcoholism, nephritis and malaria, and, if any one of these is present, it should be treated as well.

Constitutional Treatment.—I think that at the present writing the work that has been done with the arsenic preparations, and especially salvarsan, indicates that a greater controlling influence can be more quickly brought to bear on the disease by this remedy than by any other. For this reason, I believe that, as soon as the diagnosis of the initial lesions has been made, a dose of salvarsan should be given by the intravenous method and repeated by the intramuscular routes as often as indicated. In addition to this, mercury can be given as usual. Ehrlich says that he is in favor of continuing the mercury in cases of lues in connection with salvarsan.

By the administration of salvarsan, a knockout blow is given to the disease at the start and it is brought under immediate control.

A wider experience with the use of this arsenic preparation will teach us more regarding its value, as well as the dangers connected with its administration.

Corbus[1] believes that, in those early infections, the salvarsan should be given three or four times at intervals of every ten days.

In regard to giving mercury in the first stage, I believe it is most important to commence immediately after making the diagnosis, as it not only hastens the cure of the primary stage, but also lessens the severity of the secondary stage. I believe that those who have had experience in cases of lues can make the diagnosis clinically in the great majority of cases without waiting for the evidence of the secondary stage. Personally, I put my patient on treatment as soon as possible, feeling that it does much to control the disease. I believe that I can usually make the diagnosis on the first visit, either by a clinical diagnosis or by finding the spirocheta; but, if not sure, I await further development of the lesion or enlargement of the lymphatics and also for further spirocheta examinations to corroborate my diagnosis. The more cases of lues that I see, however, the stronger I feel the importance of not only quickly putting the patient upon constitutional treatment, but also of bringing him into the best possible condition for combating the disease. The preparations for accomplishing this are to give tonics to counteract the anemia, to im-

[1] *A. M. A. Journal*, February 25, 1911.

prove the digestion of the patient and to have the teeth put in the best possible order.

I have seen, before the discovery of the spirocheta, what I considered typical initial lesions of a nonulcerating character in patients, and have had the opportunity of watching them for a number of years without observing any secondary development. This was at a time when I believed in always waiting for the development of the secondary stage before putting the patient on constitutional treatment. I therefore believe that secondaries do not always appear and that the disease may either exhaust itself in the first stage or skip the secondary stage and appear perhaps in the tertiary. I feel differently now, however, than I did ten years ago, and believe that it is unjust to the patient, when I consider the lesion an initial one, not to put him immediately on constitutional treatment. But such a situation could not possibly arise at the present writing, as a patient with a suspicious-looking lesion would at once have examinations made for the spirocheta and later would also have a Wassermann test. The administration of mercury in the first stage does not, as many have claimed, prevent the appearance of the secondary stage; for the secondaries follow as they would have done had no mercury been taken, but they are of a milder degree.

**Treatment of Secondary Lues.**—This stage comes from one to six months after the appearance of the initial lesion, the average period being six weeks. During this interval, the disease is being slowly disseminated through the system, as is shown by the gradual enlargement of the lymphatic glands and by certain subjective symptoms, such as headache, pains in the bones and a general feeling of malaise. The enlarged lymphatics are first noticed in the groin, then in the neck and epitrochlear region, the inner side of the elbow, in which last situation they are almost pathognomonic of the disease. Objective symptoms then put in their appearance as already described under Symptomatology —a macular or maculo-papular eruption, a pharyngeal angina, mucous patches in the mouth and a loosening of the hair. On examination at this stage, the post-auricular and epitrochlear lymphatic glands are found to be enlarged. It is at this time that the physician must outline his course of treatment for the two years to come if he has not already done so.

Lues in the secondary stage is to-day still treated by mercury, although I have seen many cases under treatment by good physicians that were taking only potassium iodid. Various preparations of mercury are given, but the forms usually prescribed are the protiodid, in pills of $\frac{1}{6}$ or $\frac{1}{4}$ grain; the tannate, in pills of $\frac{1}{2}$ grain; blue mass, in pills of $\frac{1}{2}$ grain each; bichlorid, $\frac{1}{30}$ grain in pill or solution; or gray powder, in 1-grain powders.

The favorite preparation in this stage seems to be the protiodid. It is given in pill form, the strength usually being $\frac{1}{6}$ grain. A good method of increasing the strength is that advocated by Keyes, which is practically as follows:

One three times a day for the first three days; one night and morning, and two at noon for the next three days; then two night and morning and one at noon for three days; and later two three times a day for another three days; then seven a day, increasing in the same manner; then eight; then nine; and so on until the symptoms of mercurial saturation begin to show themselves, such as colicky pains, diarrhea, sore mouth and foul breath. When this point has been reached, the same strength may be maintained, and the symptoms relieved by taking in addition a small amount of Dover's powder or some other opiate three times a day. If symptoms of salivation occur, it is a sign that the patient has taken too much mercury and it should be stopped.

It is always well to instruct the patients to be on their guard against salivation, to keep their teeth clean, and every morning on arising to snap them together, and in case the gums or teeth feel sore to leave off the medicine immediately. It is well to brush the teeth after each meal, and on arising and retiring, each brushing to be followed by rinsing out the mouth with listerine or borine diluted with four parts of water.

I do not believe in giving an opiate to counteract the intestinal symptoms of large doses of mercury, as it is likely to create in the patient the opium habit, and it seems to me that it should never be used until other preparations have been tried which may perhaps be tolerated.

The patient's condition often improves wonderfully, in cases of diarrhea, by giving him iron in connection with the mercury. Atropin, belladonna, hyoscyamus also seem to prevent excess of saliva attendant on mercurial poisoning.

Patients can usually take at least twelve $\frac{1}{6}$-grain protiodid pills a day—that is, 2 grains—although some take as many as twenty—that is, $3\frac{1}{3}$ grains. Many stop at nine, or $1\frac{1}{2}$ grains. It appears to me that if the patient cannot take nine, it is much better to try some other preparations, to see if one can be found that can be better tolerated. It is well to have the patient on the largest dose that can be agreeably borne, so long as the active symptoms of syphilis are present, and then to fall back to three quarters of this dose, and to continue on the three-quarter allowance until active symptoms reappear, when the patient should again be put upon the full dose and kept upon it during their activity, when the dose can again be dropped to three quarters. If the protiodid cannot be well borne, I know of no better salt to try next in order than the tannate, and I am convinced that this is in every way a better preparation than the protiodid. The tannate may be given in pills of $\frac{1}{2}$ to 1 grain in strength, and may at times be increased until the patient is taking 5 grains a day. This form seems to be well tolerated, and the patient obtains more mercury than by taking the protiodid. It seems to me that this salt is not sufficiently used by the profession.

In almost every case in which I use mercury alone internally except in the constipated cases I prescribe the tannate. It passes through the stomach with-

out being acted upon by its acids, and on reaching the duodenum is converted by the alkaline juices of this portion of the intestine into minute metallic globules which are readily absorbed and which produce no intestinal irritation. In using protiodid, I find my patients have colicky pains and small diarrheal movements as the result of intestinal irritation, but in constipated cases the slight laxative action appears to benefit them. In the City Hospital on one occasion, I had a patient who took seventy-five $\frac{1}{5}$-grain protiodid pills a day, grew fat and flourished—a strong contrast from others who can only tolerate five.

The method of prescribing tannate of mercury is as follows:

℞ Pil. hydrarg. tannici oxydulat. ..... gr. ss.
Sig.: One three times a day and increase as directed.

This means that they increase the number every four days until they have reached the point of tolerance, when they continue on three quarters of that amount.

The salicylate of mercury is popular with a few syphilographers. They begin with $\frac{1}{5}$ grain three times a day, and increase accordingly. It is considered especially efficacious when there are so-called rheumatic pains accompanying the trouble.

Pil. duo, containing two grains of mass hydrarg. and one grain of ferri. sulph. exsic., is advocated by others, and is one of the best ways of giving the mass hydrargyri that we have. Patients are at times able to take two of these, t.i.d., although one t.i.d. is usually sufficient. Personally, I do not like this pill, as I have seen many cases of salivation follow its use.

Inunctions of mercurial ointment are more efficacious than are the internal remedies, and are especially indicated in cases of obstinate headaches, rheumatism, iritis and when the salts of mercury cannot be well borne when given internally. Patients usually object to them, however, as they are unclean and irritate the skin. From thirty to one hundred and twenty grains may be rubbed in at each treatment. I usually prescribe it in papers; Chart. ung. hydrarg. grs. xxx locally at night and generally increase the quantity by five to ten grains, every three to six days as chart. ung. hydrarg. grs. xxxv and so on. It should be rubbed in as follows: The first day, on the inner side of the legs; the second day, on the inner side of the thighs; the third day, in the iliac regions; the fourth day, over the sides of the chest; the fifth day, over the inside of the upper arms; the sixth day, over the flexor surfaces of the forearms; and the seventh day, no rubbing. These should be taken at night before retiring, together with a hot bath. The rubbing should last for twenty minutes. A bland ointment may be applied after each inunction. Woolen clothing should be worn during a course of inunctions and changed every six days. Symptoms of salivation should be watched for during this treatment, as it is liable to come on

very suddenly. Inunctions are generally used at the cures, such as Aix la Chapelle and Hot Springs, which is a proof of their value.

Thermal Springs.—Waters, such as those of the Hot Springs of Arkansas and Aix la Chapelle, are very beneficial and do much for the luetic cachexia. The drinking and bathing increase the capillary circulation. Besides this, they also increase tissue activity and elimination in consequence of which larger amounts of mercury and iodid of potash can be tolerated. Sulphur baths are said to have no more effect than the water of ordinary springs. Hot-water baths at home are of benefit during a course of treatment and I always give them, lasting for ten to fifteen minutes at night, at a temperature of 100° to 108° F. Hot-air baths (Turkish) are also beneficial. More mercury is tolerated when the body is exposed to heat in summer than in winter. Turkish-bath rubbers, stokers and men working in hot places, tolerate more mercury and iodid than do men not exposed to so much heat.

Hot bathing, Turkish baths and drinking waters are also of the greatest benefit in mercurial poisoning (salivation), as in this way the elimination of the mercury is increased more rapidly than by any other means through the skin, the kidneys, the intestines and the salivary glands. This is due to the increased metabolism and the disintegration of mercurial albuminates. Patients bear hot-air baths better than hot water, and the efficacy of the hot-air treatment is increased by drinking a fairly large quantity of water.

Heat locally by means of hot-air and hot-water bags, hot-water applications and hot bichlorid compresses are all beneficial in hastening the disappearance of luetic lesions, especially when combined with mercury, or mercury and iodid. The change of air and scene and the regular life at the Springs are also of the greatest benefit to the patient, both in the secondary and the tertiary stages of lues.

I believe that certain baths, such as at Aix la Chapelle, must contain unknown properties in the water that especially benefit patients suffering from tertiary forms of the disease. I have had patients with lesions of the nervous system who were practically incapacitated and growing steadily worse under treatment go to the Hot Springs of Arkansas, or to Aix, and return showing the greatest improvement and able to attend to work again. My patients with nervous lesions have been benefited more by the treatment at Aix than at the Hot Springs.

*The Hot Springs.*—A few words may be here said regarding the cures at the springs where mercurial inunctions are used. The springs that I refer to are the Hot Springs of Arkansas and those of Aix la Chapelle in Germany. In both places the patients arise at 7 A.M. and have the bath in which they remain for ten to thirty minutes. At 8 A.M. they have breakfast, after which they rest for a while. At 10 A.M. or thereabout, the rubber gives them an inunction or rub, lasting from twenty to forty minutes. After this, they go for a walk.

At 1 P.M., dinner. They then lounge about for a time and later take another walk.

At 6 P.M., supper. At 10 P.M., bed.

At the Hot Springs of Arkansas they rub in at first one eighth of an ounce (60 grains), then one sixth and later one fourth of an ounce (120 grains).

At Aix la Chapelle they begin with 5 grams (75 grains) and gradually increase the strength to 8 grams (120 grains) if tolerated.

The amount of mercury may be regulated, however, as the physician sees fit in the individual case.

The results of treatment in these resorts are much better than at home, and in Aix la Chapelle they are often wonderful.

An interesting fact concerning the giving of inunctions in an institution is that the attendants or rubbers in some of these establishments use their bare hands in rubbing, which are constantly in contact with the ointment, and yet they seldom have symptoms of salivation. There is no reason, though, why a rubber should expose himself to the danger of mercurial poisoning, as the inunctions can be given equally well by the operator when his hands are covered by rubber gloves, as is now generally the custom.

Kaposi considered inunctions the best method of treatment. He said that the mercury penetrates into the subcutaneous tissues, where it is transformed into soluble albuminoids and absorbed, coming into contact with the specific virus (now known as the spirocheta) and destroys its power. From thirty to forty inunctions are usually sufficient to relieve severe symptoms, but if not, they should be continued until these have abated.

MERCURIAL INJECTIONS.—The injection method at the present writing appears to be the most approved manner of giving mercury. It is generally given in the gluteal muscles of the buttocks. The syringe and needles by which these injections are given should be surgically clean and the skin should be washed and then rubbed with alcohol. The preparations generally used are the bichlorid, the salicylate and the cyanid.

The bichlorid solution, the hypodermic dose of which is one twelfth of a grain, is one of the oldest salts of mercury used. It is prescribed as follows, Eichler's method:

℞ Hydrarg. bichlorid ..... gr. j;
Glycerin ..... ʒj;
Aq. destil. ..... ℥j.
M.

Ten drops of this solution, which is equivalent to one twelfth of a grain, is injected intramuscularly every one, two, three, four or five days, depending on how it is tolerated by the patient and the beneficial effect that is obtained by its use.

A bichlorid solution is still considered by some as the best preparation for injections.

The salicylate is another popular salt for hypodermic use. It is prepared as follows:

℞ Hydrarg. salicylat. ..... grs. xlviij;
Lanolin ..... ʒj;
Albolin .....q. s. ad ℥j.

M. Sig.: Inject ten minims (gr. j) once a week, or as often as indicated.

The cyanid of mercury is the salt that appeals to me as the best of the mercurials for injections. It is prescribed as follows:

℞ Hydrarg. cyanidi ..... grs. v;
Cocain ..... grs. ijss;
Aq. destil. ..... ℥j.

M. Sig.: Inject 10 minims (gr. $\frac{1}{10}$) every two days and increase accordingly.

N. B.—The cocain is not necessary, but deadens any pain that might follow the injection.

By injecting ten minims the patient receives the equivalent of one tenth of a grain. Bierhoff, in administering this solution, starts with ten minims every second day and increases the dose from one to two minims each time until he has arrived at the point of tolerance, which is from twenty to fifty minims at each injection, thus giving from one fifth to one half a grain of the salt as the maximum dose at each treatment. He gives thirty injections, or more if necessary, to control the symptoms. As will be seen, this takes the patient over two months of rather vigorous treatment. He then allows a period of three months to pass before giving another treatment, and then six months before giving another, and then a year before the next course is given. Some time after this last treatment, which is finished about two and one half years after its commencement, a Wassermann test is made. In the intervals between treatments, the patient takes the preparation of mercury and iodid of potash known as *mixed treatment.*

Calomel is sometimes given in suspension in one-half to one-grain doses every four days.

℞ Hydrarg. chlor. miti. ..... gr. ss;
Glycerin pure ..... gtts. x;
Aq. destil. ..... gtts. x.

Mix and inject this amount every four days. It sometimes brings on serious salivation in cases of nephritis, and does not agree with patients suffering from diabetes or uremia.

*Injections of Mercury into the Veins.*—Mercury is also injected into the veins, especially the median basilic and median cephalic. It acts quickly and is of special value in cases of lesions of the central nervous system. Bacelli's solution is the one generally used for this purpose. The all-glass syringe with a long needle of good caliber, both of which can be boiled, is considered one of the best for mercurial injections. The injections are always painful, sometimes markedly so, and at times give rise to abscess, slough or remaining nodosities. The injections are usually given in the buttocks. After the needle has been plunged in, the barrel of the syringe is disconnected from the needle to see if there is bleeding. If there is, the injection is not given, but the needle is inserted elsewhere in a place where no bleeding occurs, when the fluid is injected, after which the skin puncture is sealed with collodion. I must say that I prefer inunctions to injections.

Fumigations.—Fumigations are to-day rarely used, although they are very efficacious if we wish to produce a very rapid effect, especially in late secondary lesions. Here calomel is used, from twenty to sixty grains at each sitting. The patient is seated in a chair with a covering or blanket extending from his neck, over himself and the chair, to the floor. The calomel is in a pan under him, beneath which is an alcohol lamp. When the lamp is lighted, it generates fumes to which the patient is subjected for from twenty to thirty minutes.

Serum Treatment.—Serum treatment has been used extensively in my clinic by Dr. Littlejohn of New Haven, who has written an extensive report of its efficacy. As yet, however, I have not been sufficiently impressed with the results to use it in my private practice or to recommend it to my fellow-practitioners, although I believe that it lacks but little to perfect it to such a degree as to make it of great therapeutic value.

Treatment of Some of the Special Manifestations of the Secondary Period.—Local applications during the secondary period are frequently made in the following instances: Occasionally on the forehead, there are a number of lenticular papular lesions forming a *corona veneris*. In this case it is advisable to apply the ammoniate-of-mercury ointment, either alone or mixed with equal parts of zinc-oxid ointment in case it is too strong.

℞ Ung. hydrarg. ammoniatæ .....
Ung. zinci oxidi .....āā
M. Sig.: Apply locally.

Smear it on the forehead and apply a piece of sheet lint on retiring and allow it to remain on over night. This seems to hasten their disappearance. Ecthymatous, *impetiginous* and *pustulo-crustaceous syphilids* are also benefited by the same application. *Palmar syphilids* are also very objectionable. These cases are of the squamous variety, and may also be treated by the white-precipitate ointment alone or mixed with equal parts of boric-acid ointment

with perhaps the addition of ten to twenty grains of salicylic acid to the ounce. It should be rubbed in on the palms of the hand at night and gloves are worn until morning. In onychia and paronychia the ammoniate of mercury should be applied locally, and a glove-finger worn over the parts for protection.

*Moist papules* about the genitals are best treated by the powder of bismuth, boric acid and calomel already alluded to, with a dressing of absorbent cotton to keep them dry.

In case of mucous patches in a man's *mouth*, his tobacco should be cut off, and he should use a mouth-wash of 1 : 2,000 bichlorid solution in peppermint water four or five times a day, in addition to which an application to the patches should be made every three or four days with a 1 : 8 solution of silver nitrate, or four-per-cent chromic-acid solution. The best way of doing this is by twisting a thin film of absorbent cotton about the end of an applicator or a toothpick and then moistening it in the solution, when it is applied to the mucous patch until this becomes whitened.

In *syphilitic alopecia* the head should be washed night and morning with a 1 : 1,000 solution of bichlorid, or an ointment of ammoniate of mercury and boric acid may be applied.

In *iritis,* a four-grain-to-the-ounce solution of atropin, if instilled four times a day, is usually sufficient to keep the pupils dilated. This may be increased in strength if adhesions are forming. When opiates are being taken by the patient, a still stronger solution is sometimes necessary. In addition to this, the eye is washed out with a mild solution of boric acid as often as necessary, and in severe cases hot applications are at times kept upon the lids. If permanent adhesions between the iris and the lens result, iridectomy may be performed. Local mercurial inunctions above the eyebrow on the affected side are also of service.

The *angina* accompanying the acute stage may be treated by the solution of 1 : 2,000 bichlorid of mercury in peppermint water, above referred to, as a spray or gargle; or by a solution of fifteen grains of zinc chlorid in one ounce of listerine and three ounces of water.

Of course, in all these cases the internal treatment remains the same, and throughout the entire period of the second stage the patient should be kept in the best possible health. His digestion should be carefully watched and his diet regulated. He should have plenty of plain food, fresh air and exercise. Stimulants can be indulged in if well tolerated, but should be limited to light wines with the meals, spirit being strictly interdicted. Smoking in moderation may be allowed if it does not irritate the mouth and cause mucous patches. Sexual intercourse should be forbidden until all active symptoms of the disease have disappeared and the patient has had several examinations showing a negative Wassermann. The patient should be kept on mercury for at least two years. Mercury is eliminated quickly, and it shows in the urine two hours

after a hypodermic. It is eliminated by the kidney, mucous membrane and the salivary glands, the last showing the greatest activity. In cases of too much mercury, the strain is principally felt by the kidneys, mucous membrane of the intestines and salivary glands.

Salivation occurs when mercury is pushed too far, showing itself by increase of saliva; swollen spongy gums with a tendency to bleed; fetid breath; sensitiveness of the gums and teeth, with a tendency of the latter to loosen in some cases.

In these cases, give hot-air or hot-water baths; tinct. belladonna, beginning with ten drops and increasing to fifteen or more; small doses of iodid of potassium.

The patient should clean the teeth with a very soft brush, a piece of gauze or cotton on a stick, and rinse the mouth carefully with borine or listerine, or a saturated solution of potassi chlorate. Atropin is sometimes given, gr. $\frac{1}{150}$ every two, three or four hours. In bad cases, ulcers and slough appear in the mouth and the salivary glands swell.

**Treatment of the Tertiary Stage.**—Tertiary lues occurs in about ten per cent of the cases and puts in its appearance from three to twenty years after the initial lesion. It is much less frequently seen in private practice. Its commonest manifestations are tubercular and gummatous lesions of the skin; periostitis, osteitis, osteomyelitis, or dactylitis; rhinitis, pharyngitis, or laryngitis; orchitis or epididymitis; multiple neuritis, gumma or scleroses of the brain or cord. These forms are best treated by potassium iodid internally, and some preparation of mercury, as the unguentum hydrargyri or the unguentum hydrargyri ammoniati, locally. A saturated solution of potassium iodid may be given in water or milk with the compound sirup of sarsaparilla or orange peel, and may in some cases be increased to two hundred grains a day, which is usually sufficient to control any active tertiary lesion. As high as eight hundred grains of this salt a day have been given. This has often seemed to me very large and I rarely go above ʒj three times a day. We must consider, however, that we are fighting a very dangerous disease, and that the danger of the medicine is far less than that of the luetic condition. It should be taken between meals with a fairly large amount of fluid, either of water or milk. In the latter case, a small amount of essence of pepsin makes it more easily tolerated.

It is best given together with mixed treatment, which consists of:

℞ Hydrarg. bichloridi ..... gr. j;
Potass. iodid. ..... ℥ss;
Syr. sarsaparil. comp. .....
Aquæ .....āā q. s. ad ℥iv.

M. Sig.: ʒj three times a day between meals.

Together with this, the saturated solution of iodid of potash is given, gtts. v three times a day, added to the mixed treatment. In this way, the patient on the first day receives mixed treatment, ʒj plus the saturated solution of iodid of potash gtts. v three times a day. On the second day, mixed treatment, ʒj plus the saturated solution of iodid of potash gtts. x three times a day, and so on until the required dose of the iodid of potash has been reached. A preparation known as McDade's formula has also been much used as an adjuvant to the luetic treatment. It is taken in drachm doses before meals.

*Syphilitic orchitis* and *epididymitis* are treated by mixed treatment and potassium iodid internally, and equal parts of unguentum hydrargyri and unguentum belladonnæ externally.

*Dactylitis*, occurring in tertiary syphilis, is a condition in which the fingers or toes may be the seat of a gummatous infiltration, either in the connective tissue or fibrous structures of the joints or in the periosteum or bone. For this condition we can give iodid singly or combined with mercury, tonics internally and mercurial ointments locally. If ankylosis is inevitable, we should strive to have it occur with an extended finger. If necrosed bone is present, it should be scraped away with a curette.

For *syphilitic rhinitis*, either inunctions or mixed treatment should be given combined with potassium iodid in increasing doses internally. If the gummatous infiltration is in its early stages and there has been no loss of tissue, detergents, such as Dobell's solution or bichlorid solution 1:20,000, should be used locally as a spray or an irrigation. If, however, this breaks down, the remaining lesion may be treated by the application of silver nitrate, iodoform, or black wash. If the process continues still farther and dead bone results, it should be removed if possible. This can sometimes be best reached by dissecting up the lip and the soft parts while the bone is being removed.

In *syphilitic pharyngitis* the same treatment is employed externally and internally. The adhesions may be cut by a knife or the galvano-cautery, and new formations may be treated with monochloracetic acid. When laryngitis occurs, potassium iodid internally and sprays of bichlorid, or a preparation of the yellow oxid of mercury and vaselin may be employed locally. Papillomas may be removed by the cutting dilators, by snares or by being cauterized with acids.

*Bone Syphilis.*—In periostitis, osteitis and osteomyelitis, the mixed treatment and the iodid are used internally and a mercurial ointment externally. In gummata affecting the periosteum, which are soft, red and glazed at times, it is best not to open them unless suppuration has taken place. These may be cured by internal treatment. In osteomyelitis, when there are great pain and enlargement, if cutting down through the periosteum does not relieve the symptoms, it may be necessary to trephine the bone.

*Nervous Lesions.*—Neuritis (multiple); sclerosis, as locomotor ataxia; gumma of the brain and cord, as evidenced by aphasia; hemiplegia and paraplegia,

are best treated by inunctions or mixed treatment combined with large and increasing doses of potassium iodid. In the ordinary cases of tertiary syphilis good results are obtained by giving the mixed treatment internally and using mercurial ointments externally, and it is only when some serious or active process takes place that it is necessary to give the very large doses of iodid. It appears to me from observation in these tertiary troubles that we obtain better results from large doses taken in connection with the mixed treatment.

The iodids should be used in all destructive lesions of whatsoever period of the disease and whatsoever tissue is involved. They should also be used in the nervous forms of the tertiary period. They should not be used in the secondary period of lues, except when precocious lesions appear, such as usually occur in later stages which might prove disfiguring, dangerous or destructive, and they should usually be held in reserve, to use when tertiaries develop. They are regarded as powerfully stimulating the absorbent system.

White and Martin say: "The lesions of the later tertiary period are particularly characterized by excessive cell growth and an accumulation of imperfectly organized tissue made up for the most part of a small round-cell infiltrate, and due either to a renewal of activity at the seat of former disease, or to the crippling and obliterating of lymphatics incident to the long-continued hyperplasia of the secondary stage. The clinical proofs are convincing that iodids are more potent than other drugs in promoting fatty degeneration and absorption of the imperfectly organized exudates."

As we have the toxic manifestations of mercury during the second stage, so we have the toxic effect of potassium iodid, known as iodism, in the third stage. The symptoms of too much iodid are gastro-intestinal irritation, coryza, lacrimation, mental depression, tinnitus aurium, acne and other cutaneous manifestations. Thin says: "The rationale of iodid eruptions seems to be that there are conditions in which iodin, when present in the blood, attacks and disorganizes the blood vessels at certain localized points, and as a result of this injury to the wall of the vessels there is an escape of blood fluid into the surrounding tissues."

*Hereditary Syphilis.*—This shows itself in infants, usually appearing before the end of the second month. If it appears during the first few days after birth, it is usually fatal. The symptoms of syphilis in infants are coryza (snuffles), erythematous eruption, mucous patches about the mouth and genitals, or pemphigoid eruptions on the palm and soles. As soon as any of these symptoms appear, the patient should at once be put upon mercury. It is surprising how much mercury infants can stand, without showing symptoms of salivation. The preparations generally used are blue mass well diluted with vaselin for inunctions; calomel in one-tenth-grain doses with sugar of milk four times a day, or gray powder one grain four times a day. For the snuffles, nasal irrigation of boric acid, twenty grains to the ounce, are of value. For other lesions an oint-

ment of boric acid, the ammoniate of mercury and zinc oxid; or a powder of calomel, bismuth and boric acid should be used locally.

THE ARSENICAL PREPARATIONS.—Such a great interest has been taken of late in the arsenical preparations, especially salvarsan, that I think it is advisable to say a few words regarding them at the end of this chapter. I do not feel, however, that at the present writing we have had sufficient experience to be positive in our statements and therefore what I say will simply be an expression of the impression made upon me by cases concerning which I have some knowledge and also by the reports of cases of my colleagues.

*Atoxyl* is one of the compounds that has been the most widely known for a number of years, not only on account of its influence on the spirocheta in lues, but also on account of its action on the sleeping sickness. Although the dose of atoxyl is but ten grains, as much as seven hundred and fifty grains of the remedy have been given for sleeping sickness in a period of three weeks.

*Enesol,* the salicyl-arseniate of mercury, has also been extensively used. It comes in ampoules of 2 c.c. (thirty minims) each. It is injected intramuscularly. On the first day fifteen minims are injected, on the second seventeen minims, on the third nineteen minims and so on until all symptoms have disappeared and then the same dose is given three times a week. This has given very good results in the hands of many syphilographers and still has many strong adherents.

FIG. 939.—A GRADUATED PIPETTE.

*Salvarsan,* arseno-benzol or "606" is, however, the preparation that to-day holds the world's attention. It is sold in glass tubes containing 0.6 gram each. The dose is from 0.3 to 0.6 gram and sometimes in strong men from 0.8 to 1.2 grams is given. The susceptibility of the patient to the remedy differs greatly. Ehrlich says that there is no rule about the dose. The commercial hydrochlorid salt is rendered fluid either as a solution, an emulsion or a suspension. The intravenous method of administering salvarsan is today the most popular one and I will first consider the method of preparing the fluid to be given by this route, after which I will consider the preparation of the fluid and also the suspension used intramuscularly and the technique of the method of administering these preparations.

FIG. 940.—A GRADUATED CYLINDER.

(*a*) Intravenous Injection.—The apparatus and materials used are: A graduated pipette (Fig. 939), a large graduated cylinder (Fig. 940), an in-

travenous apparatus (Fig. 941), filter papers, a funnel, a stock bottle of normal sodium-hydroxid solution (four per cent) and a file. The needle recommended for injecting the fluid into the vein is the American modification of Schreiber's needle, which is 2½ inches long with a finger plate near the end. The needle is 17-gauge.

Fig. 941.
An Intravenous Apparatus.

The apparatus is previously sterilized by moist heat and then dried between sterile towels, whereas the ampoule of salvarsan and the file are placed in alcohol.

Method of preparing the "606" for intravenous use:

1. The ampoule is dried, opened with the sterile file and the contents poured into the cylinder.

2. Fifteen c.c. of hot water are added; the hotter the water, the more quickly the substance will dissolve.

3. Next, normal sodium-hydroxid solution is added, about 2 c.c., and shaken thoroughly. A precipitate occurs.

4. Then sodium-hydroxid solution is added, drop by drop, the solution being shaken after each additional drop until it is absolutely clear, care being taken not to add any excess of sodium hydroxid.

5. Next, distilled water is added up to 200 c.c.

6. The solution is then filtered into the receptacle of the intravenous apparatus. It is important to have a perfect solution.

(*b*) Intramuscular Injections in Alkaline Solution.—The apparatus and material used are: A graduated pipette, a graduated cylinder with glass stopper,

Fig. 942.—Record Syringe with 21-Gauge Needle.

an ampoule of salvarsan and file, which have been previously sterilized with alcohol, the same as in the preparation of an intravenous injection. In ad-

dition, a Record syringe with a 21-gauge needle (Fig. 942), and a small beaker are used.

Method of preparing the solution of salvarsan for intramuscular use:

1. The salvarsan is placed in the graduated cylinder with a glass stopper.

2. Fifteen c.c. of hot water are added immediately; the solution is shaken vigorously until the salt is dissolved.

3. Then 2 c.c. of normal sodium-hydroxid solution are added and a precipitate is formed.

4. Then the sodium-hydroxid solution is added drop by drop, being shaken vigorously after each addition, until the solution becomes perfectly clear, avoiding any excess of sodium hydroxid.

5. Then enough hot water is added to make 20 c.c. of the total solution, and it is poured into a beaker.

It will be seen that the only difference between the fluids for intravenous and intramuscular injections is that in the former the quantity given is ten times as great and consequently the dilution is ten times as great, thus making it much less irritating.

Method of Preparing the Suspension of Salvarsan for Injection.—The contents of a sealed vial of salvarsan, containing .6 gram of salvarsan, and 5 c.c. of iodipin are made into a suspension. The physician can prepare it himself by placing 5 c.c. iodipin in a mortar and adding .6 gram of salvarsan. He then mixes it with a pestle. Iodipin is a chemical mixture of iodin and sesame oil and is of the same consistence as alboline. The Record syringe is recommended for injecting the suspension.

Technique of the Administration.—The patient is sent to a hospital or to his home with a nurse in attendance and is put to bed. The part of the body to be treated is washed with soap and then with alcohol, and bichlorid solution if desired. In the case of an intramuscular injection, iodin is often painted over the area of skin to be injected.

(*a*) If for intravenous injection, a tight bandage is placed above the elbow to make the veins of the arm prominent below it. The temperature of the solution should be that of the blood. The valve is opened to see if the solution runs through the tube and needle easily and that no air bubbles are present. The needle is then thrust into the ulnar or median basilic vein. With a two-valve stopcock attachment, it is easy to tell when the end of the needle is in the vessel, as in this case the blood will run out of the vein and the syringe when the side valve is opened. When this takes place, the bandage above the vein is loosened and the valve connecting directly with the needle is opened, allowing the solution to enter the vein. With the cylinder raised twenty-eight or thirty inches above the patient's head and with a 20-gauge needle in the vein, all the solution will enter the circulation in from seven to twelve minutes. The wound is then closed with a collodion dressing.

(*b*) If for the intramuscular injection, a Record syringe with a No. 21 gauge needle is filled with 10 c.c. of the so-called alkaline solution made according to the formula given and injected deeply into the buttock on one side, after which it is again filled and a second injection is made into the other buttock. The best place to give the injection is in the outer quadrant of each buttock, carrying the needle in at a slant of 45° from above downward, as is shown in the illustration (Fig. 943), to permit the solution gradually to separate the muscles. The patient should always be put on the abdomen or side for half an hour. This was the method employed in Lesser's clinic.

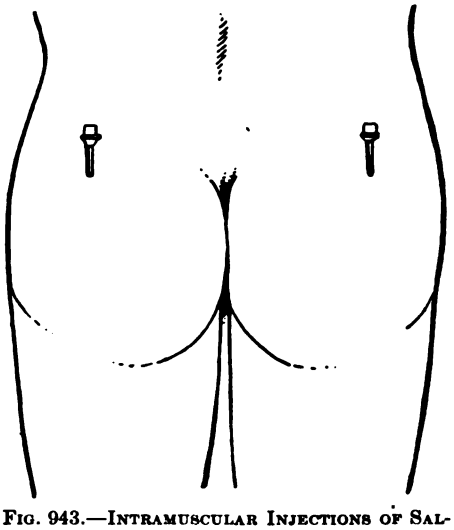


FIG. 943.—INTRAMUSCULAR INJECTIONS OF SALVARSAN SHOWING THE NEEDLES IN THE MOST DESIRABLE POSITIONS. (From Corbus.)

In using the suspension of salvarsan in iodipin, the suspension is also injected into the buttocks of the patient. Strict asepsis must be observed in the preparation and injection of the suspension as already described.

The Action and Reaction.—(*a*) When the intravenous injection is made, it almost immediately kills the spirocheta in the blood stream. In about six hours there is usually malaise, chills, abdominal cramps and vomiting. The temperature rises from 99° to 105°, generally about 101° F.; it lasts about six hours and then goes to normal.

The principal danger of the intravenous method is the puncture of a vein by the sharp needle and a consequent inflammation.

(*b*) In the intramuscular, pain radiates down the extremity like sciatica. Then an acute pain develops in the site of the injection that lasts for five or six hours. There is pain and redness resembling erysipelas over the seat of injection, that may gradually increase for three or four days. The swelling goes down quickly. It is mostly absorbed in two weeks. Some nodules may not absorb for several weeks. Temperature goes up from 99.5° to 101° F.—sometimes higher. Blood, albumin and casts may be present. Hematuria is sometimes quite marked. Local reaction is milder when the suspension is used.

Sweating occurs in cases in which there is systemic infection and is due to the endotoxins formed from the killed spirocheta.

The treatment of pain is hot sitz baths. Insomnia is treated by hypnotics, such as trional; pain and cramps by morphin. Patients with renal complications are placed upon a milk-and-Vichy diet.

The leucocyte count is double and sometimes treble the normal.

As a rule, the general condition is improved, and there is a notable increase in body weight after the subsidence of the local and general effects of the injection.

Results.—In favorable cases, the spirochetæ disappear in from four to forty-eight hours. Initial lesions heal in from ten to fifteen days; skin lesions and mucous patches in the same time or less. The results are poor in the paraluetic troubles, that is, the luetic diseases of the nervous system. In *epilepsy* with a positive Wassermann reaction, this became negative in fifty per cent of the cases after treatment with " 606 "; and in the experience of Alt, the disease itself was much improved clinically.

In some cases the treatment is a complete failure, but generally the symptoms are benefited by the treatment. Bad results also occur, such as atrophy of the optic nerve.

The treatment is contraindicated in serious diseases of the heart, kidneys and arteries, in eye diseases, in acute febrile troubles and in nervous diseases.

In every case, the patient should be informed that the remedy, although an excellent one, has not yet stood the test of mercury and that the promise of a definite cure by one or more treatments cannot be made, also that a certain risk is involved in its employment.

Effect of " 606 " on the Wassermann Reaction.—The statements of authors concerning the effect on this reaction vary in very wide limits, as nearly one hundred per cent become negative according to Wechschmann and forty-four per cent according to Neisser. The change usually manifests itself after forty to sixty days. Several authors state that the reaction remains positive, also after repeated injections, in a number of cases after the syphilitic eruptions had healed. In many cases where the reaction was temporarily negative, after the injection, it became positive in the course of a few weeks. In a number of syphilitics, a negative reaction after the injection first became positive and then disappeared again.

The opinion regarding the value of salvarsan, " 606," is constantly changing, but I believe that it will continue to be considered a valuable aid in treatment, especially in bringing cases recently infected quickly under control, and in combating the serious and destructive complications of lues. I also believe that it is the most powerful drug that we have to-day for this purpose. In all precocious syphilids of the secondary stage, that is, of the type that generally occurs in the tertiary stage, intramuscular injections of salvarsan should be given of the strength indicated and as often as necessary. In the tertiary period, the appearance of a beginning gumma on the face, or in the air passages, should be regarded as an emergency and an intravenous injection of salvarsan should be given, to be repeated if indicated or followed by intramuscular injections later. The same applies to a case of luetic periostitis or osteomyelitis, in which symptoms of pain or pressure are present. If symptoms of pressure are present point-

ing to gumma of the brain or spinal cord, the same treatment should also be given. With precocious suppurative secondary or tertiary lesions of the skin of the body, salvarsan should also be given.

In all the conditions requiring salvarsan that I have just indicated, the treatment by mercury and the iodids should be continued as before. It will not, however, be necessary to give such large doses of iodid as has often been the custom heretofore.

**Information for Patients Regarding the Treatment of Lues.**—On account of the numerous questions asked by patients suffering from lues at the clinic and the limited time for answering them, the following pamphlet was prepared some years ago and handed out to patients desiring information.

## DIRECTIONS TO PATIENTS SUFFERING FROM LUES (SYPHILIS)

### USED IN DR. GUITERAS'S GENITO-URINARY CLINIC AT THE POST-GRADUATE MEDICAL SCHOOL, NEW YORK

1. *Syphilis* is a *contagious disease,* involving in all cases the patient's *entire* system. It is usually ushered in first by a sore on the genitals; then follow headaches, pains in the bones, an eruption spreading over a large part of the body, sore throat, patches in the mouth and sometimes loss of hair and inflammation of the eyes. Of these, with the exception of the sore on the genitals, the patches in the mouth are most contagious, and the inflammation in the eyes the most dangerous, while the most severe skin troubles, when they do occur, give rise to scars which never disappear. It must be remembered, however, that cases vary greatly in severity, and that all the above-mentioned symptoms need not necessarily be present.

2. *The cure of syphilis* can almost always be assured in a healthy individual who will place himself in the hands of his physician and obey him implicitly. The time required for the treatment is *two to three years.* Usually after the first few months almost no symptoms are noticed, but they *will probably show themselves* if the treatment be stopped.

3. *Unfavorable Cases.*—In patients suffering from tuberculosis, Bright's disease, diabetes, alcoholism, anemia, malaria, or any other constitutional disease, syphilis is usually more severe, does not lend itself so well to treatment, and the outlook for cure is not so favorable.

4. *Mercury.*—The patient should be treated with mercury, usually in the form of pills, or else rubbed into the skin in the form of an ointment. If the patient is taking too much mercury, he may have symptoms that are often worse than those of the disease itself. They are, sore gums, loose teeth, bad breath and sometimes colicky pains and diarrhea. In such cases, the patient should stop taking the medicine until the symptoms disappear, and, when he

begins to take the mercury again, should take not more than three quarters of the dose which he formerly had been taking.

5. *When to See the Doctor.*—The patient should report to the doctor if any fresh local troubles develop, or if there be any cause for worry which is not understood. In order to have his case carefully watched, as it should be, the patient should report to the doctor every week for the first three months, every two weeks for the next nine months and every month for the second year, or oftener if the doctor so directs.

6. *The Contagion of Syphilis.*—The patient must be careful not to give the disease to others by kissing women and children on the mouth. He should not drink from a common cup or glass with others, nor use the same towels, scissors or other toilet articles. The discharges from the first sore (chancre) and the saliva and discharge from the patches in the mouth and throat are the most contagious about the patient. Therefore he should be careful to keep his fingers out of his mouth, and to wash his hands thoroughly after touching any other contagious places. He should keep his hands clean and touch others as little as possible. He should sleep in a separate bed, and should remember that he may be a source of danger to others about him, especially during the first year after the development of the disease. He should therefore train himself to think of this danger of contagion to others and act accordingly.

The patient should not have sexual intercourse during the two or three years of treatment. If unmarried, he should not consider marriage for at least three years after the development of the chancre. Intercourse during these years should be considered a crime. If the patient is married, he should also abstain from intercourse with his wife, and should confess to her, in order that she may be careful of herself and children in their home life. If he infects his wife, it means that she will have to go through the disease, and that the offspring may be miscarried, or stillborn, or that the child, if brought up, may be sickly, deformed or weak-minded, and therefore a burden to the parents as well as to the community.

7. *Hygiene of Lues.*—The skin should be kept in good condition. Tepid baths should be taken in the morning, followed by a good rub, if no eruption be present. A hot bath should be taken every two or three days. Sometimes a hot shower, followed by a cold one, is of benefit. Turkish baths may be taken once or twice a week, if no active skin troubles be present. Patients who work in hot places, and perspire freely, can as a rule stand the largest amount of mercury. For the same reason more mercury can be borne in summer than in winter.

The genitals should be kept scrupulously clean, also the cleft between the thighs, and in case of the appearance of any undue moisture, irritation or of an eruption on these parts, they should be dusted with some bland powder and covered with a thin pad of cotton.

8. *Care of the Mouth and Teeth.*—This is very important. As soon as the patient knows that he has the disease, he should have a dentist put his teeth in order. Sharp edges should be filed down, cavities filled and stumps pulled. The teeth should be brushed with a soft brush after each meal. Tooth powder should not be used more than once a day. Particles may be removed from the crevices between the teeth with silk floss. The mouth should be washed out after brushing the teeth with a mouth wash consisting of borolyptol and water.

9. *Mode of Life.*—Exercise moderately, enough to produce perspiration without tiring. Live regularly, taking meals at prescribed times. Go to bed early and sleep at least eight hours. Avoid all excesses, and do not give way to unnecessary worry. Wear flannels of varying weights, both in winter and in summer. Be careful not to expose yourself to cold or wet.

10. *What to Eat.*—The following rules for diet should be observed:

**Diet List**

**Soups,** except tomato.

**Fish.**—All fresh fish, boiled, baked, or broiled. Raw oysters, scallops, lobsters and clams.

**Meat.**—Beef, mutton, roasted, boiled or broiled; poultry; game; pork, veal, lamb chops or cutlets; eggs, soft boiled, scrambled, poached, raw or in omelettes.

**Farinaceous.**—Cracked wheat, oatmeal, mush, sago, tapioca, rice, hominy, barley, macaroni, vermicelli, whole-wheat bread, stale or toasted wheat bread, brown bread, milk toast, corn bread.

**Vegetables.**—Green peas, string beans, parsnips, turnips, spinach, cauliflower, mushrooms, celery, lettuce, asparagus, sweet potatoes, white potatoes in moderation, preferably baked.

**Desserts.**—Custards, rice or cornstarch puddings, blanc mange.

**Drinks.**—Water, plain or aërated, cocoa, chocolate, milk, koumiss. At the physician's discretion, a small amount of red wine with dinner and a limited amount of coffee may be given when no active symptoms are present.

**Smoking.**—Tobacco in any form should be prohibited if there are sores in the mouth. At other times two cigars a day are allowed. Chewing tobacco, cigarettes and pipes are interdicted. Tobacco irritates the mouth and throat, and is injurious to the system.

**Avoid** eating anything fried, or any pickled, salted, canned or preserved meat or fish. Avoid fruits, pickles, condiments and alcoholic drinks, tea, pork, pastry. Vinegar should not be used.

**Special Note.**—Let the animal food predominate over the starchy, and let it form part of every meal.

## PROPHYLACTIC TREATMENT

The following rules for the prophylactic treatment of soldiers exposed to venereal diseases, especially lues, are here considered.

(1) The entire organ is scrubbed with liquid soap and water for several minutes and then washed well with a solution of bichlorid of mercury 1 : 5,000 to 1 : 2,000. If there are any abrasions present they are sprayed with hydrogen peroxid from a hand atomizer. (2) The man is then placed in a sitting position, well forward in a chair, in front of a convenient receptacle and given two injections of ten- to twenty-per-cent argyrol solution. He is required to retain each injection in the urethra for five minutes. (3) The entire organ is then smeared thoroughly with twenty- to thirty-three-per-cent calomel ointment; about two grams is usually sufficient. Especial care should be taken that the glans and the prepuce are thoroughly covered. (4) He is told not to urinate for at least two hours and to allow the ointment to remain on the organ for some hours. A temporary dressing is then put on the genitals.

Colonel Maus of the Army has much simplified the above method and has had excellent results by the use of calomel ointment alone after a cleansing wash. The ointment is made of calomel thirty per cent, thymol five per cent and benzoated lard sixty-five per cent, and is put up in a collapsable tube. After the individual has been exposed to luetic, gonococcal or chancroidal infection, he is instructed to urinate, wash the organ thoroughly with soap and water, force the ointment into the urethra and smear it over the organ, especially the glans and prepuce.

## NOGUCHI'S SKIN TEST FOR LUES (SYPHILIS) BY MEANS OF LUETIN

Luetin is the name of a killed emulsion of pure cultures of the Spirocheta pallida to be injected into the skin for the purpose of producing a reaction (lesion) indicating the presence of lues. It will thus be seen that it is governed by the same principles as the Von Pirquet test for tuberculosis. It denotes an allergic condition of the skin, either hypersensitive or hyposensitive.

The object of the test is the same as that of the Wassermann, namely, the diagnosis of the presence or absence of lues.

The preparation of the emulsion, like that of tuberculin, will always lie with the laboratory, but the test itself may be easily made by the practitioner. The skin of the upper arm is sterilized with alcoholic sublimate solution, and 0.05 of a cubic centimeter are injected intradermically. When properly given, the epidermic layer is raised up sharply as a bleb.

A control inoculation in the other arm was invariably made for comparison

with the luetin inoculation, and consisted of an equal amount of the culture medium without spirocheta, that is, the carbolized ascitic agar containing sterile placenta.

The reaction develops in twenty-four to forty-eight hours; it may be papular, pustular, or "torpid," in which latter case the original macule fades in three to four days, but ten days later suddenly reappears as pustules.

Negative reactions fade in one to two days, positive reactions disappear in a week to ten days.

Noguchi's series is of 400 cases: 177 luetics, 77 paraluetics and 146 controls.

In primary and secondary lues with insufficient or no treatment there was no reaction. Only in a few cases was there an indurated papule. Secondary cases which are or had been under mercury and salvarsan and in which clinical signs of syphilis are absent may show a severe reaction. In tertiary and hereditary stages the reaction is strikingly positive.

**Results in Noguchi's 400 Cases.**—In 5 cases, initial lesion, the reaction was positive in only 1. In 50 secondary cases, 13 of which had active symptoms and were under slight mercurial treatment, the reaction was positive in 3 only. In the remaining 37 secondary cases, which had no symptoms, all of whom were under antisyphilitic treatment, the reaction was positive in 26. There were 59 tertiary cases; 27 of these had symptoms and were under mercurial or salvarsan treatment, all of which gave a positive reaction. The remaining 32 tertiary cases, which had no symptoms, gave 19 positive and 1 negative reactions in those on regular antisyphilitic treatment and 11 positive and 1 negative in those under salvarsan treatment. In 10 cases of cerebro-spinal syphilis under regular treatment, 5 gave positive and 5 negative. In 30 cases of latent lues under no treatment, 24 were positive and 6 negative. In 23 cases of hereditary syphilis, 20 of which were under regular antisyphilitic treatment, 19 gave positive, 1 negative, and 3 under salvarsan gave 3 positive reactions. There were 77 cases of parasyphilis; 72 of these had general paralysis, 45 of which gave a positive reaction. In 5 cases of tabes, 3 were positive. In 146 so-called "controls" (nonsyphilitic cases treated with luetin for comparison), 46 normal and 100 suffering from other diseases, the reaction was negative in all.

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